

THE WAY
OF George
Sava
A SURGEON

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The Way of a Surgeon

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THE WAY OF A SURGEON

by
GEORGE SAVA

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Prologue

The nearer one stands to anything, the less one can see of it. The more intimately one is associated with anything, the less likely one is to perceive the alterations that it may undergo. In the words of the familiar English adage, one cannot see the wood for the trees. Yet some sudden shift of viewpoint, some unexpected change of routine, may stress the hitherto unnoticed differences with a weight that sometimes has the force of a blow. A friend whom one has been in the habit of seeing every day for years goes abroad for, perhaps, a year; when he returns, one notices with a shock that his hair is grey, his face a little lined, his carriage not so erect as it used to be. All this, one asks oneself in surprise, cannot have occurred in a year, so brief a fraction of a man's life? Then comes the answer. This is not the work of a year or of two years; it is the sum product of the little changes of many years—changes that, because they took place imperceptibly under our eyes, we did not notice.

Some such experience is surely within the memory of every one of us. They do not always relate to personal matters; indeed, they more often than not have reference to other things—particularly to one's work. Not long ago, I had a rather striking experience of this kind in connexion with my own work. A case of peritonitis was brought to me. I organized the usual treatment of this day and age and bade the relatives not to worry unduly; the chances, I told them, were odds on a complete recovery. To me, it was a more or less routine affair, and I put down the anxiety of the relatives—their apparent belief that cases of peritonitis

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almost invariably had a fatal termination—to their natural concern. The patient's father, indeed, took me aside for a private word.

"Thank you for being so optimistic in front of my wife," he said with the air of "now we are men together, we can talk", "but surely there's very little hope? My mother died of peritonitis, so I know something about it."

"I was merely stating the truth," I replied. "Nowadays there is an odds-on chance of recovery, as I told you."

It was afterwards that those words returned to me. The operative word was "nowadays". In his way the man was right. I recalled with a shock that when I was a student, and even when I was a young surgeon, such cases as these were almost always regarded as hopeless, and that recovery was looked upon as something of a miracle. The simple truth was that I had lived too close to the progress in medical science. Through the papers in the medical journals, the addresses given before medical societies, contact with my fellow doctors, and even, to some small extent, my own researches, I had absorbed the advances in knowledge and technique automatically, without seeing how significant and even startling they were. What was an almost certain fatal case twenty years ago was today looked on as something more than a reasonable risk. That applied not only to peritonitis but to many other conditions, and in some cases even more strikingly; for some that were practically inoperable and beyond human aid of any kind twenty years ago are today almost commonplaces in medical practice.

It was this experience that opened my eyes and made me stand back a little from the close-up and somewhat narrow view that the practitioner inevitably tends to get in his day-to-day work. I began to compare then and now—twenty years ago with today; and the astonishing progress I discovered was illuminating. Perhaps it was even more so to me than to those who look on surgery and medicine from the outside. So it was that I found myself developing a new

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habit. Whenever a case was brought to me, I began asking myself: "Yes, but how would you have treated it when you were beginning? *Was* there any treatment then—any real treatment?"

From out of the past came the voices of professors and teachers and of senior doctors with years of experience behind them, warning me at the time that, though of course one did what one could, certain cases were beyond reasonable hope; the best thing to do, these warnings seemed to say, was to pray that a minimum of such cases would find their way to one's consulting-room. Yet in 1911 one could look on those conditions without fear, in many cases without doubt.

Individual cases came to my mind. I remembered this one and that, and compared it with one on which I had just been consulted. In the end I decided that here was the material for another book. The cases, the comparisons between then and now, over a period so short as to be well within the lifetime of the majority of us, would provide in themselves, I believed, a great deal of interest. But beyond that, I felt—and still feel—that these comparisons might have a lesson to teach.

Too many people today are, quite justifiably, unaware of the rich resources of modern treatment. Because, when they were younger, a relative or a friend died of a certain condition, then regarded as incurable, they cling to the belief that that same condition remains incurable—just like the father of the patient in the case I mentioned earlier; and so, not unnaturally, they refrain from taking treatment until their disease is well advanced, thus jeopardizing their chances of a successful outcome and making the work of the surgeon doubly difficult. Moreover, by their own action in holding back, they sometimes contribute to the survival of the belief that this or that is incurable. If their cases have fatal terminations, it is more often than not due to the fact that they came too late; not the disease, but their own tardiness, caused their death.

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This may seem harsh speaking, but it is too true. There is nothing more saddening to the doctor than seeing a case which he knows he could have saved quite easily if it had come to him in time, but which is now beyond human aid because the whole system has been drawn into the vortex of disease and breakdown. Today, this experience is more galling than ever before, because so many of the conditions hitherto regarded as hopeless or incurable have been removed from that despairing category and placed on the ever-growing list of those which medical science has brought under control.

Only an ignoramus would claim that medicine is now all-powerful and that it has won the final victory over disease. There are major problems that stare the doctor in the face almost every day. That must be frankly admitted. But that does not mean that he is defeated on all fronts. Far from it indeed. Many of the greatest doctors of the past, be they surgeons or physicians, would, if they could revisit this earth, feel humble in the face of what they might think the miracles worked by the least of their modern brethren.

Of course, a great deal of this is common knowledge. "The progress of medicine", whether in a limited field—like, say, the development of penicillin—or the entire range, has become the theme of popular articles in the press and of many popular books. But these treatments, excellent as many of them are, leave behind a trace of doubt in the common man's mind. He asks, not unreasonably, whether all these advances do not lie in the realm of theory, whether the new treatments are proved and practical, whether, in fact, they have really had much influence on the day-to-day practice of medicine.

That is why, in these pages, developing my theme, I have held on to a sheet anchor of humanity. I have turned to my casebooks, past and present, to my memories of what was possible to my elders and betters when I was young, and of what today I and my colleagues do as a matter of course. I

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have tried to compare what happened twenty years ago to such a case of which I had first-hand experience, and what happened only last week to a similar one that came to my consulting-room. I have not argued or tried to argue that because such and such a thing happens to rats and guinea-pigs it will also happen to human beings. My comparisons, in short, are between what I used to see and what I see now; and I believe that they will be as striking to others as they have been to me. I have got so far away from the trees that I can see the wood—and I hope to be able to induce others to notice, with me, that it has grown and matured and become lovelier and more graceful—a place offering surer and more pleasant shelter for those who must seek its protection.

CHAPTER I

New Ways with the Brain

Memory is an unreliable record. Sometimes it acts as a mirror, reflecting faithfully every minute detail of some vital experience; at others it is only a distorting glass, magnifying the trivial while blurring and distorting the significant. For all that, there are yet events that it crystallizes into a seeming eternal reality—events that were not only remarkable in themselves but also landmarks in one's history to which one can turn again and again for reference.

There is one such memory which always comes to mind whenever surgery of the brain is discussed or a case of head injury is brought to me for advice. It happened long ago—in June 1432—when I was a newcomer to this country and a humble house-surgeon in a hospital in the north of England. If I close my eyes, I can see the scene all over again with all the sharpness of a vivid present. I can recall every detail of the large operating theatre, hushed to a deadly silence. I can experience again the growing tension in the air as the surgeon approached the climax of his operation—a tension that in the end became so great that every one of us assembled there, doctor or student, barely dared to breathe. I can experience once more that dreadful feeling which came to all of us, though none knew for certain what was happening on the table—a feeling of impending and mounting tragedy as though in the stillness we could hear the beating of death's wings.

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It was a case that had a special interest for me for several reasons. I had made a point of being present at the operation, firstly, because it was to be an operation for brain abscess to be performed by Mr. K——, whose reputation as one of the greatest British brain surgeons had reached me even on the Continent, and, secondly, because I had had, in a small way, something to do with the case itself, since I had received it into the hospital. Moreover, quite apart from its medical features, it attracted me. Perhaps I was young and impressionable; perhaps it was one of those strange manifestations of the mind that scientists now call paranormal, but I had felt from the very first an aura—if that is the right word—of tragedy and foreboding about it.

Three days before, I had been on duty in the out-patients' department. There one learns many things, not least the art of being surprised at nothing; yet, though I flattered myself that I had become inured to the worst that could befall, I confess that when this case arrived it shocked me profoundly. The patient was brought in an ambulance, and it was at once evident that it was no ordinary case. Two attendants seemed to be battling with the young man, whose age I assessed at somewhere about twenty-eight. He was in the paroxysms of a violent fit, and it was as much as those two stalwart men could do to restrain him. His appearance was macabre. One side of the face was so distorted as almost to have lost human semblance and become a mere grotesque mask. His arms and legs were threshing convulsively, and there was something inhuman in their wild, powerful and wholly purposeless movements. With him was a small, mild-looking man in gold spectacles, who turned on me a glance in which fear, anxiety and horror were intermingled in an expression of utter hopelessness.

Obviously it would be impossible to examine the patient in his present state, and when he had been removed to a ward where he could be kept under constant restraint, I spoke to the little man, who turned out to be his father, and asked for further information.

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"I don't understand it—I don't understand it at all," he said miserably, passing a handkerchief over his bald head, which was moist with perspiration. "There's nothing to explain all this."

"You did not notice anything until he became violent?" I asked.

"Nothing to speak of," he replied. "He had a small boil on his upper lip, but that was only due to his scratching himself with the razor when he was shaving—you know how easily that sort of thing happens, doctor. Then a little later he complained of violent headaches, but that didn't seem anything to worry about. We all have headaches, don't we?"

"And then?" I pressed, seeing in him all the signs of the man who wants to play down the minatory warnings.

"Then he—he became like this," murmured the little man brokenly. "He tried to throw himself out of the window, and he was very violent when we tried to restrain him. Look."

He pushed up his coat sleeve and showed me some nasty scratches and a heavy bruise.

"We only just managed to save him," he said. "He was almost too much for Ian and myself."

"Ian?"

"My younger son—Andrew's brother."

"I see."

The most I could do was to send the worried man away with such promises of solace as I could offer. It was not at all a promising case—especially in 1632.

For two days we battled with him in the hospital. Nothing but morphine would keep him quiet—and one cannot keep a man indefinitely under the influence of that drug. But, at any rate, he could now be examined, even though he could give the specialists who saw him no co-operation. The diagnosis was made. Here was a case of abscess on the brain. So much was deduced from external evidence. In

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those days—though it was only sixteen years ago—the technique of diagnosing brain conditions was almost primitive. X-rays could not be used, and there was no means of confirming the decision. Yet all the signs pointed to it—and more. Already there were indications of a dangerous general infection, while the look in his eyes suggested that there was pressure on the brain.

Because the brain is the most important part of the human body, the centre of all those things which make man what he is, it is encased, as everyone knows, in a bony skull to protect it from accidental injury. This skull is very valuable and essential to our survival, but if anything goes wrong with the brain it can contribute to the makings of a dangerous situation. If there is infection, as in this case, there is no way by which the fluid can escape, so that the brain itself swells—a state known as brain oedema. And as the brain swells so it presses on to the thick, unresilient skull, producing pressure that may inhibit such vital functions as respiration and circulation. The brain is, so to speak, stifled by its own armour.

There is only one thing to be done in such circumstances: the skull must be opened in an attempt to relieve the pressure. This is one of the oldest things known to surgery as the records reveal—but that did not mean, in 1632, that the technique was either safe or advanced. Only in the most extreme cases did surgeons resort to it. This was such an extreme case, and so it was that Mr. K——, the eminent brain specialist, was called in to operate.

Because it was an unusual intervention, most of us went to the operating theatre to watch, and all of us stared fascinated as the surgeon cut back a large area of the scalp to expose the glistening white skull beneath. That shining bone looked so inviolable that it seemed almost an outrage for man to attempt to pierce through it. Then round the circumference of a three-inch circle the surgeon bored small holes about half an inch apart. Now came one of the critical

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moments, for, with a chisel, he cut away the bridges connecting hole to hole, so that when it was done he could lift a circular piece of bone away from the skull and so expose the soft brain beneath.

There could be no doubt now that the diagnosis of great pressure was correct, for, as the bone was taken away, the brain itself swelled out through the orifice like some strange, fantastic balloon. With a blunt knife the surgeon attacked the brain itself, cutting through to the abscess to remove it. The air became heavy with the purulent odour of infection. As quickly as he could—for speed was then regarded as essential—the surgeon inserted a rubber-drainage tube and closed the wound.

It was then that the cloud of tragedy which had hung over the case broke, for barely had the stitches been secured than it became evident something had gone wrong. The surgeon and his assistants were leaning over the patient with that taut mien which means only one thing to the experienced spectator. The silence that descended was absolute, almost tangible; and in it one thing became frighteningly apparent—the patient was no longer breathing. The brave attempt had failed.

Mr. K—— made a small, fatalistic gesture and turned towards us—the doctors and students who had come to watch his skill.

“I am sorry, gentlemen,” he said quietly, “but here once again you have a demonstration of the seriousness of brain infection. If you operate on an abscess soon enough, you have perhaps a twenty-per-cent chance of success—but our man was too far gone. Yet we have to take that chance. He would have died anyway; and when a patient is doomed to die no odds are too heavy if they contain the faintest glimmer of success.”

His words came as an anticlimax to the dramatic atmosphere of a few moments earlier, yet he was speaking no more than the truth as it was known then. He was not trying

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to wash his hands of responsibility or to excuse a blunder: he had done as much as any surgeon could have done, and more than most; he had accepted the heavy odds against him like a courageous and conscientious surgeon, and he had lost.

The memory of that occasion has often returned to me, but at no time more vividly or more pointedly than in the summer of 1647, just fifteen years later, when I myself was called upon to perform an operation on a case of brain abscess. It barely seemed possible that the operation I was then about to undertake, without any undue doubts about the outcome, was to be almost precisely the same as that which Mr. K—— had performed almost as a last and desperate resort. In particular, comparing that occasion with this, one thing stood out most clearly. I recalled how he had worked at top speed, trying to get it over in the shortest possible time. That was considered right then, but today it is known to be fatal. Brilliant researches carried out by Dr. Harvey Cushing in the United States have proved conclusively that surgery of the brain must be performed deliberately; the more slowly it is done, the better. Today the surgeon may occupy anything from three to eight hours to open the skull, and it is only by these seemingly leisurely measures that the patient has a high chance of recovery. Yet in 1632 Mr. K—— worked as though possessed by fiends. In the case of mine to which I have just referred two hours were occupied in opening the skull. When this had been done, the abscess was gently located, without any hurry at all, and the site was connected by means of a small tube to a bottle of penicillin solution which constantly irrigated the site of the growth for a period of forty-eight hours. At the end of that period the danger was at an end, and the wound could be closed to heal naturally.

That patient recovered, as today the larger proportion of such cases do. Not twenty per cent, as Mr. K—— said in 1932, but sixty per cent of brain-abscess cases are nowadays

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successfully operated upon, thanks to the advance of knowledge in both surgery and chemistry. To this happy development the surgeon has contributed the slow, patient technique which, as it were, cushions the delicate brain from shock; the chemist has given as indispensable aids those magic masterpieces penicillin and the sulphonamide drugs.

Brain abscesses are not, fortunately, the most common affliction of the brain. Injuries caused by accident or even violence are, however, fairly frequent, but these also can be serious—and once again the armoury of the surgeon has been considerably enriched in recent years to deal with them.

Let us look briefly at the types of injury that may occur. There are two main classes, known respectively as closed injuries and open injuries.

Closed injuries are so called because, even though the skull itself may be cracked with many radiating fractures, just like a “starred” window-glass, there is no actual opening through which the brain is exposed. These injuries are perhaps the most common of all damages to the brain, for the hazards of civilian life, from a street accident or a violent quarrel to slipping on the soap in the bathtub, may cause them. Open injuries are most common in war, for in these a portion of the skull is actually torn away by violence, such as a bullet or a shell fragment.

Concussion is the name most associated with closed injuries. Concussion has been defined as “temporary paralysis of the nervous functions”, a polysyllabic phrase that means little more than unconsciousness. Though there may be a fracture of the skull, the serious aspect is the actual concussion, caused by the brain itself having been subjected to a blow. Often, the signs of concussion do not reveal themselves at once, and therein lies the danger, for subsequent unconsciousness may not be connected with an earlier accident that seemed to have no untoward results.

About three years ago, for example, I remember being called suddenly to see a young boy of fifteen, who, his

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mother told me, had been unconscious for about two hours, and had remained unresponsive to every means of revival that had been tried.

"What happened?" I asked. "Did he just faint?"

"No," said the mother; "I don't think it was a faint."

"Had he had an accident of any kind?"

"Only a slight one," she answered. "That was about eleven o'clock this morning, when he came home and said he had fallen off his bicycle in trying to avoid a dog. He had hit his head on the pavement, but it didn't seem at all serious. He's used to hard knocks."

"H'm!" I remarked. "He didn't faint there and then?"

"Not at all," she returned. "He had a light lunch, saying he didn't want much because his head ached, so I gave him a couple of aspirins and told him to rest for a little. The headache didn't get any better, and then he started twitching on one side of his face and said that it irritated him."

She burst out crying.

It was a typical case of internal haemorrhage, which is due to the rupture of a small blood vessel in the brain known as the middle meningeal artery. It passes through the bone of the skull about two inches in front of the ear, and when it is torn, as it may be even by a slight fall, the blood immediately starts to collect slowly between the bone and the covering of the brain. At the outset the patient may notice nothing more than a headache, which may last for a couple of hours or longer, and it is only later that the more dramatic signs begin to show. Then, as with this boy, the face starts to twitch and all efforts to control the movement prove unsuccessful. In the end the sufferer relapses into a state of lethargy like a deep sleep, until at last he becomes completely unconscious. The pupils of the eyes are noticeable in this state, for one of them—that on the injured side—is very markedly dilated. If left untreated, the patient will almost certainly die within a few hours.

To the mother of this boy, as to many others similarly

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placed, this appears a very alarming state of affairs, but modern surgery can work wonders in such cases. Indeed, there is no operation on the brain which gives such spectacularly successful results. Yet it is a very simple procedure.

A small window, or aperture, is cut in the bone about two finger-breadths in front of and above the ear. First the skin is cut and turned back as a flap to expose the skull and then the bone itself is drilled through quickly with a special cutting instrument that can be worked either manually or by electricity.

To the distracted mother of the boy even this simple operation, involving practically no risk at all, sounded terrifying, but I prevailed on her to raise no objections, since, if the outcome were to be successful, no time must be lost. These are cases in which speed of treatment is essential. In the end she overcame her qualms, and I was able to arrange for the boy's immediate removal to a neighbouring hospital.

Here, under local anaesthesia, the skull was opened by the method I have already described. The boy was still in a state of coma by the time I had reached the brain. One glance was sufficient to show that the diagnosis had been completely correct. The blood had seeped out to form a clot about the size of a small plum. When this clot was carefully removed, the small blood vessels began again to trickle, and the various points of bleeding had to be closed by means of an electric needle. When this had been done, the main part of the operation was over. The skin was replaced over the skull and a few stitches were inserted, a firm, thick dressing of cotton wool being applied.

It was then that what appeared to the mother a miracle happened, for the boy opened his eyes, just as if awakening from a deep sleep, and asked for her. To her eyes the recovery was complete, though we had been in the hospital for barely more than half an hour. But, of course, the restoration was not quite as dramatic as that.

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It was three o'clock in the afternoon. At six the patient was given a sedative; and after spending the night in deep sleep, he awoke ravenous for his breakfast. Ten days later he was again riding his bicycle—though with a more than usually wary eye for dogs—and taking a normal part in his school life. To look at him, no one would have thought that less than a fortnight earlier he had been in the shadow of death itself.

Many types of accident can give rise to brain injury of this kind, particularly in industry, and, of course, concussion is common in time of war. Not always are these injuries simple concussion, however, especially when some heavy object or instrument has fallen on the head. Then, what is known as a depressed fracture is caused. Though the skin of the scalp itself may be unbroken, the bone underneath has been broken and the displaced bony fragments pressed down upon the brain.

In these cases the symptoms may be anything from severe headache to unconsciousness or even, in extreme examples, paralysis. The condition is immediately recognizable by the surgeon, whose fingers reveal the little hollow in the surface of the skull where the fracture is located.

Here again simple operative treatment can work wonders; and once again it is usual to carry it out under a local anaesthetic. The anaesthetic used is, of course, the now familiar novocaine, which is injected round the seat of injury and renders the tissues insensitive to pain, though the patient himself remains fully conscious and can even, if he feels so inclined, carry on a conversation with the surgeon while the operation is going on. Sometimes nervous patients do not like the idea of remaining fully aware of what is being done to them, and then they are given a little gas to induce a state of twilight sleep.

As I have said, the procedure is quite straightforward. The skin is first cut away from the site of the fracture to expose the bone, which is usually found to be broken in two

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or three places, the pieces pressing downwards onto the brain. A special tiny metal lever is employed to lift these fragments away and restore them to their proper position. Sometimes it is necessary to smooth away rough edges on the broken pieces of bone in order to secure what the engineer would call "a good fit". Finally, the skin flap is restored and stitched into position, and when this has been done the patient is free of anxiety and well on the road to recovery.

Whenever the skull is opened, one of the first things the surgeon looks for is signs of swelling in the brain itself. If he sees this danger signal, which is comparatively rare, he makes use of special drugs, which are injected, to absorb the fluids in the brain that are causing the distension.

One more possible source of damage to the brain is provided by brain tumours, which are often regarded with the utmost fear by those who hear of them. Yet they are not nearly so dangerous as is popularly believed. Few of them are malignant growths, dangerous in themselves; such trouble as they cause is due to pressure on the brain.

Not long ago a patient of mine called H—— D—— came to consult me about headaches that had been worrying him for three years.

"Why didn't you come earlier?" I asked.

He shrugged his shoulders. "Why worry?" he responded. "They were only headaches. I've only come now because I'm beginning to feel my arms and legs aren't what they were. They're losing strength, so to speak."

"I see," I said, "or rather I shall. I'm going to send you along to be X-rayed."

The X-ray photograph revealed what I had expected—a tumour on the brain. It was located on the left side and was obviously beginning to press fairly deeply into the brain tissues. When he saw me next, I told him that it would have to be removed, but that it would not be necessary to put him to sleep; everything could be done under a local anaesthetic.

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"You can even smoke if you want to," I observed.

"Thanks," he replied with a smile. "I'll learn. I'm a non-smoker, you see."

I never learnt whether he did take up smoking, but I do know that the operation was as successful as it was simple. The simplest way in which to describe it is to liken it to scooping a hard-boiled egg out of its shell. A fairly large piece of skin had to be excised, together with the bone beneath it, and then it was possible to shell out the small tumour. Finally, the skin and bone flap were replaced and held by a few stitches. That was six years ago, and there has been no further trouble. My patient has never had his work as a civil engineer, which takes him to many places in the world, interrupted.

It may seem a far cry from the tentative, abortive brain operation I witnessed during my early days in England to the techniques of today which make the removal of tumours and the alleviation of concussion simple, everyday jobs for the surgeon—cases he can undertake without any of the worry and anxiety that attach to risky procedures. But that does not measure the whole of the vast distance covered; for now brain surgery is reaching out beyond the treatment of mere injuries to the actual alleviation and cure of mental diseases—surely as exciting and as remarkable an advance as any in the whole history of surgery.

Mental disease is undoubtedly among the most pathetic and terrible of all the ills to which the flesh is heir. The madman is a travesty of humanity, yet there are many more cases, hardly less terrible, which show none of the more overt signs of madness and that would never be certified. The pages of the textbooks are full of them—as, indeed, are many of our mental hospitals and institutions. Their story is familiar, summed up in the phrase "slow deterioration of personality". Once they were apparently normal, useful members of society; then, for no apparent reason, they begin to "grow strange". They complain of curious hallucinations;

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depression—a deep, torturing depression—dogs them constantly until, in the end, all too many of them start to consider suicide as the one escape. It is with cases of this kind that surgery has recently secured some remarkable triumphs.

Like so many scientific discoveries, this one began almost by accident. In Portugal a very depressed mental patient tried to put a term to his sufferings by throwing himself under a train. From his own point of view his efforts were unsuccessful, for though he was very badly injured he still lived. From the point of view of humanity, he may well be regarded as one of its greater benefactors. His case came under the care of a distinguished Portuguese surgeon, who managed to save the man's life by a very delicate and difficult operation on the front part of the brain known as the frontal lobes, where the injury had been deep and extensive. The surgeon was satisfied that a life had been saved. Certainly neither he nor anyone else expected the seeming miracle that followed.

In due course the patient recovered. But he was no longer the same man—or, rather, not the man he had been when he attempted suicide, but a reversion to an earlier phase. For now he was no longer the victim of dark and torturing depression. His fears and hallucinations had gone completely. Above all, he was glad to be alive.

This curious outcome set Dr. Egas Moniz, the surgeon concerned, thinking. He realized that accidentally he had stumbled on a significant discovery. The argument was simple. If the accidental destruction of the frontal part of the brain could cure a mental patient, then could not similar damage, deliberately induced, lead to similar results? It was a question that only experiment and experience could answer; and Dr. Moniz, with his associate Dr. Lima, set out to discover the facts. The result was an operation that has since become famous as a landmark in surgery—the procedure of leucotomy. Moniz and Lima had developed a technique to sever the tissue connecting the frontal lobes

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from the rest of the brain. Like so many apparently startling operations, it is simple, yet the results have been astounding.

So revolutionary a treatment could not, of course, be accepted at once in its entirety; but in both England and America every opportunity was taken to gain further experience. Today operations for certain types of mental disease have become a practical routine occurrence.

Here is a case of which I had personal experience. Now in her early thirties, my patient had been a mental case since the age of sixteen, and she was given to periodic bouts of extreme depression, combined with outbreaks of violence and a refusal to take food of any kind. On occasion these attacks were so severe that she grew dangerous. Once she picked up a heavy breadknife and threw it at her father, and it was then that the question arose whether it would not be better to send her to a home, where she could be kept under proper control, or to adopt some drastic treatment.

To me, when I was consulted, it seemed a case in which the brain operation might be tried; and on my advice one of the leading English brain surgeons was called in. He agreed that the conditions were favourable for the attempt.

It was a fascinating operation to watch. First, the surgeon made a small incision on either side of the scalp, just in front of and at the level of the ear. Then a small, thin knife was inserted through holes drilled through the bone of the skull, and it was drawn backwards and forwards with a gentle sawing action until the brain was severed in two. When the blood had been swabbed away the skin was stitched back into position. Put down in cold blood, that seems an alarming procedure from which the chances of recovery could not be high; yet it is a fact that the shock to the patient is even less than that involved in the removal of the appendix, to which so many submit without the slightest qualms.

For a few days after the operation the patient complained of a slight headache, and she was also prone to vomit, but

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when this phase had been passed she changed into a mood of happiness. A new life opened up before her, a life in which she could take an interest and even perhaps attain real peace. But it must not be thought that she was restored completely to normality. On the contrary, she seemed to have reverted to her childhood, and exhibited all a child's lack of responsibility and restraint. It was as though twenty years of her life had been cut away by the surgeon's knife and she had been transported back through time to her early youth. This was not unexpected. It had happened before in other cases, and at the time this particular operation was performed the reason for the condition was by no means understood.

Experience was to provide the answer here as in all things. It took some years, in fact, before surgeons discovered why leucotomy—or, as the Americans prefer to call it, prefrontal lobotomy—gave rise to this state of immaturity. And, when it was discovered, the reason seemed, as it so often does, obvious. Necessarily the operation causes damage to extensive tracts of the brain tissue, and what it destroys are those parts which control our intelligence and mental development—the so-called higher centres. But the results attained were so good and the promise appeared so great, that a determined attack was made on the problem to discover whether there was some less damaging means of securing the same outcome without the deterioration.

In the end perseverance and scientific approach were successful. Within the past year, as I write, a new operation has been performed at the University of Pennsylvania. It is called thalamotomy, and it marks a further step forward hardly less remarkable than Moniz's original discovery.

To understand it it is necessary to know a little about that important organ, the brain. It consists of several portions, some controlling our mental development and others concerned with the vital functions of respiration, circulation, and so on. Each of these areas has its own particular name,

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derived from Greek or Latin, but there is only one of these which is of interest for our present purpose: that is a very important part at the base of the skull known as the thalamus. Into this nerve centre run several branches from the frontal part of the brain. This is the feature that struck the surgeons at work on the problem of leucotomy.

The idea was quite simple. It was argued that if these branches connecting the thalamus with the frontal lobes could be burnt with an electric current, so severing the connexions, similar results to those of the leucotomy operation could be attained, but without the inevitable and accompanying damage.

This is what has been done in the University of Pennsylvania. It is as yet too early to speak of complete success, for the whole procedure remains experimental, yet, for all that, the results are highly encouraging. A very curious-looking apparatus is employed for the treatment, which is performed electrically throughout. By means of a complicated electrical instrument fitted to the skull the course of minute currents is traced, and from these the route to the thalamus is mapped out. When this has been done, the bone is drilled and an electric needle is inserted at the very base of the brain, burning the thalamus.

Watching this operation, one might perhaps be tempted to think that the surgeon of the future will be more of an electrical engineer than a doctor, and indeed there is nothing very strange in the thought. For modern science demonstrates more and more the unity of things, as though, beneath all the surface differences, there is one master principle. Thus it is now established beyond all doubt that the activities of the human brain are carried out by electric impulses, as though every one of the millions of cells in the brain were a minute electric battery. When this highly organized and elaborate electrical network breaks down, the result is what we call a mental case; from which it would seem to follow that if we could re-establish the electrical

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balance—recharge, as it were, the defective cells—normality or something like it could be restored. Experience in another field of psychological medicine with the well-known electric-shock therapy does more than suggest that this is far from being merely an attractive theory.

The brain was almost the last of the strongholds of the human body that the surgeon feared to attack. Even twenty years ago he knew that if, taking his courage in both hands, he dared to intervene, he was more than risking defeat. Yet now he no longer doubts his skill. Not only has he found the way to make use of his existing weapons, but he has devised new ones of a strange and fascinating character; and in so doing he has created a new and highly specialized branch of healing, to which the name of psychosurgery has been given. That curious, indefinable entity, the human mind, would seem the least likely to be amenable to the surgeon's knife, yet who can say what further wonders the future does not hold in store? Who knows but that in another twenty years the surgeon may be as indispensable an ally of the psychiatrist as he is today of the physician?

CHAPTER II

The Gentle Art of Re-Creation

Not always, when one compares today with yesterday, are the advances made so striking as those described in the previous chapter. Looking back, one discovers no revolutionary new techniques; one sees instead an infinity of small steps, each one almost imperceptible at the time, yet adding up, in the end, to a not inconsiderable distance. It is like climbing a long and gentle hill; one barely notices how the horizon progressively enlarges until, at last, one reaches the summit and the full view strikes one with all its force and beauty. This is so, I think, in regard to plastic surgery.

To many, plastic surgery seems something new and sensational; but this is because it was only during the last war that its possibilities as something more than a mere extension of the beauty parlour's work came to be generally realized. Then, the skill of plastic surgeons restored to greater or less normality many of those who had suffered terribly at the grim hand of war. But there was good plastic surgery being done at the end of the 1914-18 war, and many of the techniques still in use have a long and respectable ancestry. Yet when one sums it all up, one realizes how great the progress has been, how much one takes and does for granted today that a few years ago would have been considered risky, experimental, questionable, or downright dangerous. And perhaps the greatest, most important, and most valuable change of all lies in the rapidly altering attitude of the public

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towards plastic surgery. Today patients come of their own free will, not out of vanity but because they feel—and know—that the plastic surgeon can help them to be better human beings, and often break down the barriers that prevent their leading full and satisfactory lives. Opposition there may still be in some quarters, for prejudice dies hard in this as in all things. But the fact remains that nowadays one does not, in the expressive American phrase, have to “sell” plastic surgery where it is clearly needed. Enlightened men and women take it as part of the rich resources which surgery has made available for the benefit of humanity.

Let me illustrate these general points by a fairly recent case of mine.

The entry in my appointment book said simply: “Miss M—— H——”, which conveyed nothing to me; and when Miss H—— was shown into my room, it so happened that, for the moment, I could do no more than bestow a casual glance on her. My secretary had called me away, and I left her alone for a few moments while, with a few words of apology, I went to attend to some urgent business.

When I returned, she was sitting patiently in the easy-chair in my consulting-room, a shy, timid girl. That, in itself, was a remarkable fact, for as I entered I had been able to take stock of her. Perhaps she was twenty-five or twenty-six, certainly not more. Her cheeks had the rosy bloom of youth on them, and her fresh complexion was an indication of perfect health. In her way she was quite good-looking, with a sort of tidy, careful prettiness that her dark hair emphasized. At her age and with her personal attributes, she should have shown far more self-confidence than she possessed.

I found myself wondering why she had come to see me. Certainly there was nothing about her to suggest the patient. Perhaps, indeed, she was nothing of the kind; she might be someone whom a friend had sent to me with an introduction to help her to obtain a job. Frankly I was puzzled. But now

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I was confronting her, and, as she smiled diffidently at me, the puzzle was solved. Her eyes were eloquent of trouble. They held a look which should never be in the eyes of one so young—a look of deep and nagging disappointment, such a look as one sometimes sees in the eyes of older people to whom the years have brought nothing but disillusion and failure. She was holding her head, oddly, a little to one side, so that the left of the neck was hidden from me. I wondered what significance that might have.

"Now," I said, when I had renewed my apologies for leaving her, "what can I do for you?"

"I'm afraid you will think I'm wasting your time," she replied timidly, "but—I want you to help me if you can. It means an awful lot to me."

Her voice was subdued, almost sorrowful; far more revealing was the fact that as she spoke she turned her head gently, disclosing on the left-hand side an ugly scar running the length of her neck.

"Do—do you think," she went on almost inaudibly, at the same time reddening, "something could be done about — about this?"

"Let me see it," I said, trying to convey to her that there was nothing at all unusual or impracticable about her request. At my suggestion she loosened her dress, and I was able to examine the bluish scar which ran far down beyond the base of her neck.

"How did this happen?" I inquired.

"It's been there ever since I can remember," she answered. "It happened when I was very young. Our maid spilt a boiling teapot over me."

It was not the scar itself that distressed her; it was all the barriers it had raised, the unhappiness it had caused. Her life was one long record of frustration. She had never taken part in games at school because of the embarrassment which the pointed remarks of her schoolfellows caused her. She had never dared to mix with boys and young men because

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of the sense of intense shame, amounting nearly to guilt, she had developed. She had taken to wearing high-necked frocks and blouses—and been nicknamed “The Nun” as a result. Her story was familiar enough to me. No plastic surgeon has failed to hear such stories many times in his career; yet, for all that, it made me angry at the unthinking ruthlessness of the human kind, which is so ready to aggravate other people’s misfortunes. But for that scar—even more, but for the thoughtlessness of other people—she would have been a happy, vivacious girl, not the timid, inhibited, prematurely ageing woman who almost shrank in the chair as I looked at her.

“Yes,” I said, “I don’t think that would give much difficulty. But tell me: why have you put off coming to see me or another plastic surgeon for so long? If that had been dealt with years ago you would have been saved a great deal of suffering.”

“I did not know till recently,” she replied, “that anything could be done about it. I happened to have a cousin in the Air Force during the war. He was badly burned in a crash, and they worked wonders on him. So—so I wondered if anything could be done for me.”

I smiled. “You need not wonder,” I assured her. “Quite a lot can be done to put that right. The scar is old and large, I admit, but with care it can be removed and the place covered with new skin that will be practically invisible—unless of course you go out of your way to point it out.”

She laughed, and the sound pleased me. I felt that for the first time in her young life she had seen a ray of hope.

In some detail, for I wished her clearly to understand what was involved, I explained to her the two possible methods of dealing with the scar. One was to remove a piece of skin from one of her breasts and place it over the gap left by the excision of the scar. The other was to make use of the left arm. A portion of skin would be cut from the left arm, but would remain attached to the member at one end;

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then the arm would be raised to the neck, and the skin would be stitched to the place where the scar had been. The latter method is known as a pedunculated skin graft, because the skin is left attached to its original site by means of a pedicle in order to prevent it from dying; while the graft is taking, it is still being nourished. The former method, suitable for small scars, is known as a free graft, the skin being removed immediately to its new site. Obviously a pedunculated graft would be the more advisable in her case.

She listened intently and with great interest, and I saw that ray of hope grow brighter in her eyes. I had no wish to discourage her, but I did not wish her to run away with the idea that a miracle could be worked overnight.

"It will probably take three or four operations," I pointed out. "So large an area is best dealt with in three or four stages if a satisfactory result is to be achieved."

She smiled. "That doesn't matter," she said, with unexpected decision. "I've suffered so much already in various ways that I think I would undergo anything if it held out a chance of my getting rid of this thing."

"It will only try your patience," I responded. "You need not fear it will be painful. You must be prepared to resign yourself into my hands for six or seven weeks."

So it was arranged.

Operations of this kind are almost always performed under local anaesthesia. I had decided to make a pedunculated graft from the left breast, from which I cut out a portion of skin about the size of a hand. After the scar had been excised, this skin flap was twisted upwards and stitched over the raw area of the neck, after which the wound was bandaged and left for a fortnight. The scar on the breast was scarcely visible, for the edges of the wound were brought together and stitched so that when healing was complete all that remained was a fine, white line.

The joy and delight of this girl when, the final operation having been completed, she realized that she was in no way

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different from her fellows is amongst the most cherished of my memories. For the first time in her life she knew that she could move at ease among her fellow human beings and take part in the social activities that she had hitherto missed because of her self-consciousness over her scar. Not long afterwards I received an invitation to a wedding. The names on the card conveyed nothing to me, and it was not until I turned it over that I realized it was my erstwhile timid patient. There was written: "You must come, for it was only your operation on my neck that made this possible." A happy ending indeed.

There was, by modern standards, nothing at all remarkable about this operation; such things are part and parcel of the daily routine of plastic surgery today. But it does illustrate how great those normal routine possibilities are—and also that it is something much more important than vanity which induces people to make use of them. For this girl was not one who would resort readily to the artificialities of the beauty parlour. She was seeking not to improve upon nature, but to win back that part of her natural birthright which chance had taken away from her; and she was a sufferer from anxieties and worries that, in later years, might have had a serious psychological effect on her.

Wounded and burnt soldiers, airmen, and sailors, during the war—and after—have been restored to normality by the art of the plastic surgeon; but the usefulness of this branch does not end with war. Every day our mechanized, industrial civilization takes its toll of humanity. There are burns and maimings in the workshops; there are accidents on the roads. Disfigurement comes unasked and undeserved; and plastic methods can re-create much, if not always all, of what has been lost. The conditions of modern life have made the plastic surgeon an indispensable guardian of our bodily comeliness.

Step by step, the range of plastic surgery has been widened and extended. Skin is only one of the tissues that can be

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grafted. Indeed, there is barely a human tissue that cannot be transplanted to make good what accident or injury has destroyed. Bone and cartilage are today commonly employed in plastic operations, reconstructing broken jaws, replacing missing bones, rebuilding damaged noses.

There was a Canadian airman who was sent to me for treatment just a few months before the war ended. A bullet or shell fragment—I forget which, and it does not matter—had carried away part of his upper jaw. He had retained his life, but that was all. In his state he could barely have mixed in society or earned a living unless he had chosen to wear a mask, for where his check should have been was nothing but a gaping hole. I have seen many grim sights among war casualties, but few, if any, worse than this. He knew it, for he regarded it as a tragic irony that his life had been spared.

“That’s how it is, doctor,” he said to me grimly. “Unless you can patch up this face of mine I just don’t want to live.”

With difficulty I persuaded him to forget such nonsense. Something could be done, I assured him, and he would have no cause for regret. He agreed to consider what was possible, but I could feel that he was extremely sceptical and looked upon it all as a last forlorn hope of which little was to be expected.

The first thing was to remove all the scar tissue, a not inconsiderable procedure in itself. Then a large piece of bone was taken from the shin and trimmed to the exact shape of the jaw. When this had been completed, the bony piece was screwed into place with special metal screws and finally bandaged with a special mechanical device that resembles a metal helmet, closely fitting to the head, and provided with metal rods that hold the screws firmly in position.

This helmet is one of the latest aids to plastic surgery, and represents a great advance. It is worn for about four weeks, after which it can be removed and a skin graft is made to cover up the scars and gaps. The final stage does

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not lie with the plastic surgeon; it consists in a visit to the dentist, who provides the denture that is to complete the reconstruction.

From first to last, this operation—or series of operations—covered a period of four months. My Canadian friend was not effusive in his thanks when he came to give me a final handshake before his return across the Atlantic, but he expressed his gratitude in a more convincing way than any well-chosen words could have done. He was openly and genuinely impressed at the change that had been wrought in him, and he told me that he would gladly have endured it all—even the helmet—for two years, instead of four months, if he had realized that so much could be achieved. Except for a small scar, which he was able to hide beneath a moustache, there were no outward marks of the operation, and it would have been difficult indeed for anyone to have realized that, only a few months before, this man had been so disfigured that he would not dare to show his face—or the remains of it—in public.

One of the most important advances in plastic surgery has been the introduction of bone and cartilage grafts in the medium of chips. Quite recently it has been discovered that gaps in the human body are better filled when such chips are employed than when large pieces of bone are used; the latter do not heal well and are difficult to mould to the desired contour. Moreover, the smaller the chips, the better are the results. The chips are packed tightly into the gap, which is then covered with the skin and soft tissues, the whole being kept together by bandages. In time, the chips fuse together into a solid mass, indistinguishable from normal bone. This is “plastic” surgery in a more literal and narrow meaning than the usual term. This remarkable development was introduced by a well-known English surgeon, who had to deal during the war with so many cases that he had to find a quicker and better way of bone grafting than older methods provided. Hundreds of war-injured men must

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be grateful to his ingenuity—an invention truly mothered by necessity.

But it is not only the injured and maimed with whom the plastic surgeon has to deal. There are, too, those on whom Nature herself seems to have laid a curse—those who are born ugly or deformed. As a young surgeon I remember being called to attend an Italian who had attempted to commit suicide—and for no other reason than that he had been born with a nose so grotesque that it might have put even Cyrano de Bergerac to shame. He had begun by shunning people; then he took to drink; and finally he became convinced that the whole world was ridiculing him, and that life was futile. When I told him his nose could be reduced in size and to almost any shape he wished, he thought I also had joined the chorus of derision, and it took great patience and persistence to convince him that the operation could be performed.

In the end he consented. Today that operation is of almost daily occurrence in the plastic surgeon's life, but then it was not so usual. Under local anaesthesia the whole skin is freed from the bony structure, and part of the bone is cut away with a small, special saw, after which the rough edges are smoothed with a file. This is carried out entirely from inside the nose, where the incision is made. When the desired shape is secured, the wound is closed and left to heal. This particular patient was able to leave the hospital four days after his admission and he celebrated the occasion by immediately setting about looking for a job. When last I heard of him he was a useful and contented man with no grudge against the world.

More difficult is the reconstruction of the jaw, yet this is an operation which today is regarded as commonplace, whereas when I first performed it it was looked upon as one of the more intricate procedures of plastic surgery. Often it is necessary for quite other reasons than those which brought the Canadian to me. One patient, for example,

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came to me because he had been cursed with a jaw so receding that it barely existed; it was proving a distinct handicap in what ought to have been a distinguished career, for all his business friends believed that his chin denoted extreme weakness of character and therefore would not trust him with anything that demanded determination and forcefulness. Yet naturally his was a very aggressive character.

In this case, a large piece of bone was taken from the patient's rib and placed under the skin of the jaw. The scar is hidden in the crease of the neck, where it is almost invisible except to the closest inspection. Altogether, the operations lasted three weeks, and the young man emerged with all his confidence restored—so much so, indeed, that he immediately began to arrange to emigrate to one of the Dominions, where he felt there would be more opportunity for his new-found vigour and self-confidence.

The advance in plastic surgery, then, must be seen rather as an accumulation of detailed improvements, yet just recently there has been one fundamentally new introduction that may well prove to be one of the most important ever made. Until only a short time ago it was accepted that the only satisfactory grafts of skin or bone were those made from structures taken from the patient himself. Skin from other human beings did not take, and fat grafts died. Occasionally, it is true, gaps were bridged with ivory or even ox-bone, but this was only when no other course seemed open. The human system objects to foreign bodies of any kind, and it was apt to treat these substances with contempt and hostility, so that the results were rarely lasting.

This conception that only autogenous grafts, as they are called, should be used is now undergoing modification, for not long ago an American surgeon began to use a material new to plastic surgery though known for many years in other connexions. This is the black mineral substance known as tantalum, which was employed at the beginning of the century for making the filaments of electric-light bulbs.

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Experiments showed that in some ways this material behaved like living tissue, and that it could be introduced into the body without setting up dangerous irritations. It is, moreover, chemically inert, another great advantage.

Use has been made of this material for grafting not only on the face but also in the replacement of missing nerves and in the repair of skull defects. Here indeed is something that opens up entirely new prospects in plastic surgery. A gap in the skull is not only unsightly; it is extremely dangerous, for it is a point of weakness at which the slightest blow might cause the most serious damage to the brain.

The new technique is to make a plate of tantalum to cover the defect and so seal the gap. In making it, the surgeon adopts the technique of the dentist; first he takes measurements and prepares a mould of the damaged area. From this mould a plate is made conforming precisely to the gap, since tantalum is extremely malleable and can be bent and twisted to any desired shape. A few holes are drilled, and the plate is fixed with tantalum nails to the skull, after which the skin is stitched into position over the plate. Provided the essential precautions of cleanliness are observed, there are, so far as present experience goes, no untoward effects, and the plate can remain in place without further attention throughout the patient's life.

Tantalum, indeed, seems likely to be the answer to many of the prayers that the plastic surgeon breathes when he is faced with a particularly difficult case. It can be used in innumerable ways, even for the dressing of wounds, for which it provides a completely non-irritant and inert covering. A thin foil can be made of it and employed as a protection for tender nerves and tendons when they are being grafted. It has been described as a "living metal", and it is clear that, as yet, its possibilities have been only dimly seen—though by its use some highly remarkable and otherwise impossible results have been attained. By the co-operation of surgeons and scientists, it may well prove to

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be one of the major and significant advances in a branch of surgery the importance of which increases with every passing year.

Yet, when all is said and done, perhaps the greatest progress of plastic surgery in twenty years has been in status. When I was a young surgeon, fascinated by the possibilities of the plastic techniques, it was still in some disrepute, a glorified form of beauty treatment, except perhaps in time of war. But today the plastic surgeon is recognized as a skilled specialist in his own right, a healer who makes good defects, working towards that ideal, which is surely the aim of all medicine and surgery, that it is the right of every human being to be complete in every sense, and that it is the privilege and duty of the surgeon to correct, by every means, defects wherever they are found, no matter whether they be inborn or the result of man's own folly or misfortune.

CHAPTER III

Mending Broken Hearts

If romantic fiction were to be believed, broken hearts would have to be numbered amongst the most dangerous of human afflictions, with a mortality rate that might well cause life-assurance offices to revise their premium scales in alarmed haste. Practical experience suggests that in this, as in other things, romantic fiction is not exactly true to life. Some girls deserted by their lovers find solace in another pair of arms, with apparently highly satisfactory results. Others discover that their sufferings can be drastically alleviated by an award of damages for breach of promise. As for men, their hearts are made of different stuff, it seems. If more susceptible, they are less vulnerable—they bend but they do not break.

Yet if one transfers the words from their figurative to a more literal connotation, the curious fact emerges that there is something to be said for the advertised conviction of these romantic novelists. Heart diseases are indeed among the most deadly of the ills of man. Those cursed with a real “broken heart” due to inborn defect, injury, or acquired disease, rarely attain their allotted span of life, or did not until comparatively recently; and in making the outlook for such sufferers brighter, surgery has in the past few years added a sensational new chapter to its history—a chapter that ranks among the most brilliant.

Thirty years ago a famous German physician, lecturing to his students, asserted that any surgeon who would so much

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as talk of operating on the heart should be struck off the register and denied the right to practise, on the ground that such a one could be only either very mad or extremely ignorant, and utterly unfit to be a surgeon. In those forceful terms he did but express the strongly held views of the times, for then it was thought that merely to touch the heart would have fatal consequences. Today the heart is not merely touched and massaged; it is actually opened and repaired—operations of which the worthy German doctor could obviously not even dream and which must now cause him to turn uneasily in his grave.

Stitching an injured heart has, however, been for some years a comparatively commonplace operation, and as I write these words my mind travels back over fifteen years to the sunny land of Italy. I had been invited to the wedding of a southern Italian girl, famed for her beauty, who had, in the romantic sense, broken many a heart in her native village and its neighbours. There had been some who had said she would never marry, that she was destined to be a *femme fatale* who would bring sorrow not happiness to those she met. But Giuseppe thought otherwise, and he considered himself the happiest and most fortunate of men to have succeeded in winning her. No suspicion that the very brilliance of his success might have its dangers crossed his simple mind.

In the manner of its kind, the wedding celebration was on the grand scale. It was an occasion with much feasting, and the rough, heady Chianti seemed in unlimited supply. At the height of the merrymaking a large, angry and powerful man forced his way through the press of people and suddenly whipped out a knife. For one desperate moment, when a hush fell on the party, he glowered at the bride and bridegroom, and then, with that skill which seems inborn in Italians, he threw the knife straight at the bride. Giuseppe alone among that half-intoxicated throng kept his presence of mind. In a single movement he pushed his *inamorata*

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aside and threw himself in front of her to protect her. A second later he fell to the ground with the knife projecting from the left side of his chest.

Instantly pandemonium broke out. Italian people have considerable experience of knifings, and it was obvious that the long, thin blade must have penetrated the heart. No good could come of a wedding that began thus; and, indeed, it seemed unlikely that there would be any honeymoon at all, for the general opinion was that the murderer, though he had failed to get his intended victim, had at any rate claimed a life. So it might have proved but for the fortunate presence of an old doctor, who no doubt had seen many such affairs in his life, and to whom stabbings were by no means the uncommon events they are to the average English G.P. Thrusting his way forward, he took immediate charge of the situation, even throwing the bridegroom's father violently aside as he stooped to extract the knife from the wound.

"Fool!" exclaimed the doctor. "If you remove that knife, Giuseppe will surely die. Leave it to me."

It is undoubtedly a natural reaction to remove the weapon in such a case, yet the doctor was right and knew exactly what he was doing. A stab-wound in the heart immediately causes haemorrhage and the blood flows into the pericardium—the tough bag in which the heart lies. As the bag fills with blood, so the space in which the heart can beat grows less and less until at last it can beat no more. If the knife is left in position in the wound, though it may not entirely arrest the bleeding, it does at any rate limit it and give the doctor time to do what he can.

Young and enthusiastic, I naturally offered my services at once and assisted in the improvisation of a stretcher to carry the injured man to the local hospital, which, fortunately, was only some fifty yards' distance. Here the surgeon was summoned; and he instantly decided upon an operation.

So, in these strange circumstances, it came about that I witnessed the first operation I had ever seen performed on

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the heart—an event that, if not actually daring in those days, at any rate demanded great self-confidence and courage on the part of the surgeon who undertook it.

It was interesting throughout. The chest having been opened, three small pieces were removed from the ribs overlying the heart, and after about a quarter of an hour's work the heart itself was exposed. The knife, still in place, was supported by the assistant to prevent its accidental and premature dislodgement. It was now plain that the weapon had penetrated the lower part of the organ, and it was surrounded by a mass of clotted blood. Now the surgeon gently took the tip of the heart in his left hand and applied careful pressure, while, with his right hand, he slowly removed the knife. The pressure was to prevent any sudden rush of blood, which would almost inevitably prove fatal. Meanwhile, the assistant was ready with the silk gut with which the stitches were to be made. A double row of sutures was inserted round the wound and knotted firmly, after which the clotted blood was cleaned away and the pericardium closed. Striking though it appears, this operation, now performed fairly frequently and never with any great anxiety, is a straightforward one. The walls of the heart are thick and strong and so take the stitches safely, thus making healing practically certain.

If Giuseppe spent his honeymoon unexpectedly in hospital, at all events his life had been no less unexpectedly saved through the skill of a surgeon who was not afraid to undertake what was then a rather exceptional operation. Within six weeks, however, the patient was discharged with his heart as sound as it had ever been—and no doubt quite ready to be broken again, though less literally, by his charming bride.

Stitching the heart in this way was just about as far as heart surgery was prepared to go until quite recently. One of the most striking advances in the past few years has been the success gained in actually putting a patch on the heart.

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There is a comparatively common condition of the heart known as coronary thrombosis, in which the blood vessels of the heart itself become blocked and clotted. All manner of ill-effects spring from this state, which usually has a fatal termination; for what happens is that an area of the heart muscle grows weak owing to lack of circulation and eventually gives way. A brilliant American surgeon, Dr. Claude Beck, having such a heart to deal with, decided to graft onto the weak place a piece of muscle tissue; and since his remarkable first success, the operation has since been repeated, thus opening up new prospects of survival for those who are afflicted with this dangerous condition.

From these small, exploratory, and at first experimental procedures, a wide technique of heart surgery is gradually being built up. The old ingrained fear of heart surgery has been dispelled, and its place taken by a confidence that before long the surgeon will have the means of dealing with most of those unhappy ailments classed together as heart diseases. Already much is being achieved.

Not long ago I was present at an operation for pericarditis, a condition in which the external covering of the heart becomes adherent to the heart itself, thus making it impossible for the vital organ to perform its proper function. The comparison with that first heart operation at which I was present was striking. Here there was no suggestion of a desperate remedy adopted to cure a desperate disease. On the contrary, the intervention, which would have been regarded with horror twenty years ago, was treated in exactly the same way as any other operation. It was part of the day's work. Skill, care and thought had, of course, to be brought to it, as must be done in every surgical intervention, but beyond that there was nothing exceptional.

Just as in the earlier experience I have described, the chest was first opened and the heart exposed. Then the whole of the front part of the leathery pericardium was removed. It is here that the greatest nicety of touch is

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demanding, for sometimes the pericardium is so adherent to the heart that it has to be separated from the heart itself, and the slightest slip might prove fatal. When the bag has been cut out, the heart is free to expand. The effect of this operation is almost magical in its completeness and instantaneousness. Typically, the sufferer from pericarditis has extreme shortness of breath; his extremities show a distinctive blue colour, and the body cavities become filled with fluid. Almost at once after the operation these signs disappear. Breathing and colour become normal; the cavities return to the usual state and the hitherto distended veins are reduced in size. Here indeed is another triumph, for pericarditis is responsible for most of those cases of sudden death through "heart failure".

None of these operations penetrates into the heart itself. If the heart is stitched to repair a wound, only the torn surface layers are touched. If the heart is patched, the new graft is attached over the weak place in the existing walls. The operation for pericarditis is concerned primarily with the bag in which the organ lies. Until very recently no surgeon had had the daring courage actually to open the heart for treatment. Yet that has now been done—and sensationally enough in connexion with babies, who might be least expected to stand up to such drastic intervention.

In recent months the term "blue babies" has become widely known through accounts in the press of operations that have been performed; yet it is doubtful whether the nature of the condition is recognized. Quite simply, it relates to a congenital, or inborn, defect in the heart and circulatory system. In the newborn child the vital vessels leading from the heart to the lungs are small, and in some cases they fail to operate at all. In such cases the small body is being nourished—if that word can be used here—by impure blood, and it is this which gives the unfortunate little sufferers the characteristic blue appearance. In the past the expectation of life of blue babies had been very small indeed.

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Not so very long ago the surgeons of the John Hopkins University in Baltimore, U.S.A., under the leadership of Dr. Alfred Blalock, decided to attempt to correct this condition surgically by means of a technique they had devised and called "anastomosis". "Anastomosis" is a medical term which means that blood circulation can be passed through an alternative route when the normal one fails, just as traffic is diverted through side streets when a main road is under repair. The operation to effect this result in the baby calls for the utmost delicacy, for often the small blood vessel that is at fault is not only tiny in diameter but also no more than half an inch in length. Indeed, even though the operation has now been performed many times, the chances of success are not unduly high. Yet each success represents a life saved. The untreated "blue baby" is doomed to early death, and the operation represents a chance, even if no very great one, of life.

It has been left to a British surgeon, a specialist at Guy's Hospital, not only to improve on this technique but also to blaze a new trail in heart surgery by actually opening up the organ itself and manipulating its internal structure. The object of the anastomosis operation just described is to bypass a stricture and to provide an alternative course for the circulation between lungs and heart by uniting other blood vessels. At Guy's a more radical method has been adopted. The heart itself is opened and the actual defect in the lung artery is removed, thus allowing a perfectly natural course for the circulation. Already more than a dozen cases have been so treated successfully.

This indeed is a triumph of surgery. The very last resistant barrier to the surgeon's knife has been removed, and the success gained in this limited field points the way to new and greater victories over those diseases which attack the very centre of life itself; for though a man may live with any other organ of the body gravely damaged—even the brain itself—as soon as affliction touches the heart his fate is

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sealed, sooner or later. The forebodings in which even I was brought up during my medical education and early practice have been swept away.

Credit for this achievement must, of course, go to those courageous surgeons who were ready to try their skill in this seemingly risky field, yet it would be wrong in this, as in other branches of modern medical achievement, to assign all the laurels to the doctors alone. Today surgery and medicine work hand in hand with the other branches of science. Without the aids and weapons supplied to him by the chemist, the physicist, the electrical and electronic engineer, the surgeon could not perform one half of the difficult and successful operations he undertakes today. Heart surgery, that most spectacular and delicate of all branches, reveals this more clearly than anything.

There is a delicate and wonderfully sensitive electrical instrument, known as an electrocardiogram, which records on a photographic film strip the variations in the infinitesimal electric currents in the heart and so reveals the changes taking place in the organ. It has an ally in the phonocardiogram, which picks up sounds far beyond the reach of the stethoscope and so conveys vital information to the examiner. But for these masterpieces of the electronic engineer's skill the surgeon would never have been able to gather together the knowledge that in the end gave him confidence even to open up the heart itself.

Perhaps even more remarkable is another new electrical instrument which can be introduced into the heart itself through an incision and which reports by means of lights exactly what is happening within. Electronic engineering, which is applied physics, has given the surgeon new eyes and ears.

One of the grave dangers connected with diseases of the heart is the transference of clots. If thrombosis occurs, the clot may be partially cleared in the heart itself, but fragments of it may be borne away to form fatal stoppages

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elsewhere. Here the chemist has come to the aid of the surgeon by the introduction of heparin, a substance which inhibits the normal clotting power of the blood. Injected into the blood stream, it ensures that no dangerous clots occur.

Of course, X-rays are the never-failing stand-by of the modern surgeon, but for the heart he uses a somewhat different type of instrument than the more normal photographic plate. This is the fluoroscope, onto which the picture of the heart is projected so that the surgeon can actually watch it at work, detect its weak places and its irregularities, and so gain the information that will enable him to plan his treatment.

The whole range of science—particularly physics in its various branches, and chemistry—is today the ally of the surgeon. In the end, of course, everything depends upon his skill and his sureness, but these things spring from confidence, and it is this confidence which these and many other instrumental aids provide for him. He no longer works in the dark without knowing what to expect beyond what his experience and intuition suggest to be likely. He *knows* before he begins. This alliance between science and surgery is probably the motive power responsible for the great strides made in recent years, not least in the once dreaded sphere of heart surgery.

To end this chapter as we began, it is perhaps an odd thought that a man with a knife, a man relying on intricate electrical apparatus, should have become in the most literal sense a mender of broken hearts.

CHAPTER IV

Air Can Cure or Kill

Old beliefs die hard. That is a true saying, and of nothing is it more true than surgery. Time and again patients come to the consulting-room in a state bordering on despair, and describing as "hopeless" conditions for which proper treatment is available and has been available for years. Often, indeed, their state is very near to desperation, because having made up their minds that their ailment is incurable they defer taking advice until they are driven by pain and sheer distress to do so. Of course, public ignorance of the latest advances in surgery—new techniques that have, perhaps, only been introduced in the last year or so—is not only excusable but also inevitable and natural. But the tragic aspect of it all is that opinions on the helplessness of medicine generally in certain circumstances still linger years after they have been proved groundless.

Sometimes, as I say, sheer misery and pain bring patients to the doctor, and then they find, to their amazement and delight, that their state is not hopeless and they have endured much suffering unnecessarily. At other times it is sheer chance that averts a tragedy and turns its threat into a happy ending. The moral of it all is the golden rule that if anything goes wrong with the human body a doctor should be consulted at once. It is his job to know what can and cannot be done. Medical science marches fast, and the near-incurable of yesterday is so often the curable of today.

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It was chance that brought the case of J—— M—— to me—a case that brings out the point that even intelligent, educated people can harbour obsolete and dangerous ideas about the current resources of medical science, and moreover be so convinced of the rightness of their prejudices that they are ready to embark on drastic and stupid courses.

When I answered the telephone it was almost impossible to understand what was being said at the other end of the line. Obviously the speaker was a woman, and probably a young one. But her words were incoherent; every intonation of her voice suggested agitation, while occasional sobs hinted at something like despair. Well, a doctor grows used to such things; one has to be calm and patient and hope that in the end some sense will emerge—for usually these voices are overtures to urgent cases.

At last the speaker managed to control herself and I learnt with surprise that it was no stranger but the daughter of a former patient of mine. I had never heard A—— H—— talk like that before; she was young, pretty, full of the joy of life, and very self-confident; tears were the last thing one would associate with her, especially on the telephone. Obviously something very serious must be the matter, and my thoughts immediately turned to her mother, on whom I had operated some time before.

“What is it, Alice?” I asked anxiously. “Is your mother ill again?”

“No, no,” she replied agitatedly. “No, Mother’s quite all right. It’s me this time. I can’t stand it.”

“But what?” I pressed. She sounded on the verge of desperation. “If you are ill, I had better come and see you.”

“I’m on my way to see you now,” she returned. “I’m not ill myself. It’s John.”

“John?” I repeated, puzzled for the moment.

“Yes—you know, my fiancé.”

Beyond the fact that she was coming to see me the conversation revealed very little. None the less, I was somewhat

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alarmed. I knew Alice and her family very well; John, the fiancé, I had met several times, and I liked him. To all of us, he and Alice made an ideal couple, obviously very much in love with each other; and I could only infer from Alice's manner that something very serious was the matter with him. All I could do, however, was to wait for her arrival to elucidate the many problems that her telephoned words had raised.

It was half an hour before she reached my rooms, and from the moment she was shown in I could see that she was very deeply distressed. Her eyes were red with crying; her whole pose was that of a woman undergoing the first strains of a considerable shock.

"Tell me," I said, when I had managed to calm her a little, "what is it? Is John very ill?"

"It isn't that so much, though he is ill," she replied despondently. "It's—it's——" She began to sob, but suppressed it. Then the final words came with a rush and she buried her face in her hands. "He's—he's—broken off the engagement."

"But why?" I asked. I was thunderstruck. No news could have surprised or shocked me more, and I could well understand her distress. I had seen them together only a week earlier, and then there had not been the slightest hint of any disagreement. It was not like John, either, to change his mind without very good reason; I knew that.

"He—he says he can't marry me. He can't marry anybody," she went on, rather obscurely. "It isn't just me."

This looked serious indeed and suggested all manner of unpleasant things.

"But why?" I repeated. "I don't understand. John's not the sort of man to say anything like that without a good reason."

"Oh no, of course not. That's what makes it all the worse. He—he still loves me. I know that. If he didn't I wouldn't be like this. I could have taken it. But—but he's been to a specialist and—and it's what the doctor told him that's made him decide he isn't fit to marry."

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"Hasn't he told you anything more than that?" I demanded.

She nodded slowly. "It's his lung," she explained. "He's developed a touch of T.B."

So that was it. I questioned Alice closely, trying to find out the exact state of affairs. Whoever it was that John had consulted had not minced matters or confined himself to a statement of his diagnosis. On the contrary, he had gone very fully into the dangers of tuberculosis with unnecessary detail, as I saw it, and had so frightened poor John that the young man had already been plunged into the depths of despair and come to regard himself as a chronic invalid. His chief fear, it seemed, was that he might transmit the "white scourge" to Alice; worse than that, he said he could not take the risk of being responsible for the birth of possibly infected children.

John had the courage of his convictions, however mistaken they might be. He had gone straight to Alice and told her that the idea of marriage must be abandoned. It would be an outrage, he contended, for her to marry a sick man. She had argued with him, telling him she did not care what happened to her; and that if he was a sick man he would need her care and attention. But he had remained adamant. He was incurable, doomed to death; his one decent course was to take himself out of her life altogether.

I looked at her seriously. The case was bad enough, it was true, from what I could gather, but there was no point in exaggerating it.

"Listen, Alice," I said earnestly, "I won't try to disguise from you that it sounds serious to me. It would be unfair to say anything else. But to say it is incurable is probably wrong. I can't say until I've seen John, obviously, but this I can tell you: every year dozens of people are cured of tuberculosis. When medical treatment fails, then there is surgery. That's the answer."

She stared at me incredulously. "But one can't operate for T.B., surely?" she asked in astonishment.

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"Of course one can. Nor is it today at all an unusual thing to do. I'll tell you what you must do. Go and see John. Tell him what I've just told you, and then bring him to see me. Never mind what he says. Get him to see me, somehow."

I never learnt how she did it, but next day both of them were seated in my consulting-room, and I talked sternly to them.

"It's about time you stopped behaving like a couple of young fools in a third-rate novel," I said. I turned to John. "You in particular, John, have got to come to your senses. Tell me, apart from this trouble, do you still want to marry Alice?"

He nodded wearily. "Of course I do. I love her; but what's the good of thinking about it now?"

"It seems to me a very important thing to talk about," I returned. "Just because you've been told you've a spot on one lung, you propose to wreck both your own life and Alice's. You seem to want to go out of your way to make her miserable. In fact, you're behaving exactly like a spoilt child."

"I can't see that," he said. "You don't advise me to marry in my state, do you?"

"Certainly not. There you're right—I'll give you that. Where you're wrong is in thinking that you must remain in that state. Don't you know that T.B. can be easily cured today, especially in the initial stages?"

"Can it?" he asked hopelessly. "What can be done for me? I suppose I go to a sanatorium and spend weeks there and then——" He shrugged his shoulders. "No. The idea's horrible."

"I'm not thinking of that at all," I returned sharply. "A sanatorium is the right treatment in some cases, but in others it's better to operate. It depends on your condition. What I want to do is see whether an operation would help you in your particular condition. Until that's been done, I think you're behaving like an unmitigated ass to go on as you are."

He took a little more persuasion, but in the end I induced him to agree to a fresh examination. This was a great step forward, and when he had been X-rayed, submitted to blood

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tests, and been thoroughly examined, a physician was called into consultation. Together we decided that the lung must be collapsed.

In this operation air is forced between the walls of the chest and the lung itself, so that the latter is compressed by the pressure. In this way the tuberculous germs die and the lung itself is rested and saved from further damage. The treatment is repeated at regular intervals, and after a year in favourable cases, or two years in less favourable ones, the patient is restored completely to health. This is the now well-known pneumothorax operation—a name that means simply “air in the chest”.

Strictly speaking, this is not, of course, a surgical intervention. There are cases, however, in which it is better to adopt true surgical methods, and this is known as thoracoplasty. In this, part of the ribs on the affected side are removed, so that the damaged lung is exposed. On the removal of the ribs, the soft tissue contracts and so the lung is compressed. It sounds serious enough, and so it is, but modern methods have resulted in an unvarying high proportion of successes in the operation. Today, thoracoplasty is one of the most powerful of all means of combating the terrible scourge of tuberculosis.

There is, too, one other method—the removal of the phrenic nerve which moves the diaphragm, an operation that paralyses the lung and so attains the desired end of collapse in which the natural defences of the body can destroy the invading micro-organisms that cause the disease.

Neither of the two more drastic treatments was indicated in John's case; a simple pneumothorax would, we decided, do all that was necessary. In almost exactly a year from the time when we began pumping air into his chest, we were able to remove the nerve of the affected lung and his recovery was complete and lasting. All this happened three years ago; and now John and Alice, happily married, are the proud parents of a fine and handsome boy.

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Tuberculosis is a disease of which most people have a wholesome dread, and this is not at all surprising, for it is widespread in its incidence. In industries in which a large amount of dust is created—coal-mining, quarrying, wool processing, and many others—workers are particularly prone to tuberculosis, due to the constant irritation set up by the particles in the air that is breathed. Silicosis is a very terrible thing, and is known, appropriately enough, as grinder's disease; it is caused by the deposition of dust in the lungs. But though these dangers are widely recognized, there is surprising ignorance, as the case of John M—— reveals, of the methods of cure that are available. Even when people know of the surgical treatments, they believe that they are drastic remedies only to be resorted to in the last extreme.

There is, it must be admitted, some ground for this belief—for, as I have said, old ideas die hard. When I was a student, the surgical procedures were known but they were not often employed, since the risk was high. Today it would be wrong to say that danger was absent from chest operations, but recent improvements have done much to eliminate most risks. Before looking at these methods let us glance at another disease of the chest, for it was in connexion with this that many of our up-to-date techniques had their origins.

This is empyaema, which is a collection of pus in the whole chest cavity. It follows pneumonia, or even in some cases simple influenza, and it is a serious condition. Its incidence nowadays is not so high as it used to be, for the administration of the wonderful sulpha drugs and penicillin does a great deal to defeat it. What directed particular attention to this infection was the terrible influenza pandemic which swept the world after the First World War—a pandemic that caused more deaths than all the murderous fighting in those four years, 1914–18.

The method adopted, one familiar to me in my early days, was to puncture the chest with a needle to discover if pus was present. If it was, then a small piece of rib was removed,

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the chest opened by a small aperture, and the pus drained off. It was not entirely satisfactory, for while the pus came out air rushed into the chest, and so a state of pneumothorax was induced—a special state known as “open pneumothorax”, which means that the chest is in communication with the outside air. The result was that the patient’s lungs were likely to collapse—not at all a desired result. From this, much of our modern knowledge sprang. The whole state was investigated. Special tubes giving an air-tight fit were invented, and other detailed improvements were devised.

Now at last the way was opened towards a goal surgeons had long sought—the treatment of disease inside the chest. The great difficulty to be overcome was that of open pneumothorax: if the chest was opened air rushed in and the lungs might collapse. The method of overcoming this danger was found to lie with the anaesthetist. The gas anaesthetic was passed into the lung at a pressure slightly greater than that of the air. It is obvious that under these conditions there would not be collapse. This made it possible to operate on a diseased lung, for the pressure could be applied to the sound lung for as long periods as necessary. Oxygen is, of course, passed in with the anaesthetic.

The most recent advance, and perhaps the basic reason for the rapid progress of chest surgery, has been the introduction of intratracheal tubes. After the patient has been anaesthetized in the ordinary way with a gas mixture, a soft rubber tube is passed down the windpipe. Often the tube is provided with a small balloon at the bottom so as to make an absolutely airtight joint with the windpipe itself. Through this tube air can be fed to the lung, under pressure if necessary; and so it became possible for the chest cavity to be opened with complete safety. These tubes, of course, are used in heart surgery as well, for the same conditions apply. But for the introduction of pressure anaesthesia and the intratracheal tube, extensive chest surgery, such as is now comparatively commonplace, would be impossible.

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During the war this advance in chest surgery proved invaluable in dealing with wounds in the chest which before had almost always proved fatal owing to the state of open pneumothorax that they created. Soldiers were provided with heavy field-dressings to apply at once to close the wound until they could receive proper attention. The surgeon treated the wound exactly as he would any other, by closing it, after it has been cleaned and foreign bodies have been taken away. Sometimes a flap of muscle from the wall of the chest has to be turned back to cover the wound. It is an indication of the safety of modern chest surgery that in these emergency treatments nothing is ever done to the lung itself if it be injured; it is better to leave what is needed to a separate operation later on. There is one difference from ordinary wound surgery, however: a small tube is inserted so as to allow accumulated blood and air to find its way out of the chest, and this tube is provided with an ingenious valve to prevent the ingress of air, with all its dangers. Penicillin and sulpha drugs, of course, are employed to prevent infection and aid clean healing.

These treatments saved the lives not only of thousands of soldiers but also of many civilians injured by bombs during the air-raids. As an E.M.S. surgeon during the war I was grateful very many times for the progress that had been made in chest surgery and the confidence it inspired.

Chest surgery has become, in fact, a very highly specialized field, and a most important one. In some ways operations on the heart and the brain may be more spectacular and appear more like miracles, yet when it is remembered that lung diseases, particularly tuberculosis, are among the greatest plagues of modern civilization, and are responsible for an alarmingly high death-rate as well as for millions of hours of lost work and ill-health, it cannot but be recognized that every advance in this sphere contributes immeasurably to the greater happiness and wellbeing of mankind at large.

CHAPTER V

The Stomach's Best Friend

Less than twenty years ago peritonitis—inflammation of the lining of the abdominal walls—was still referred to as the “fatal disease”, and surgeons greeted the mention of it with either a shrug or a shudder, according to their temperament. I well remember one of the professors of my student days talking to us after he had operated on a case of peritonitis, which had had what was in those days the almost inevitable fatal termination.

“You see, gentlemen,” he said, “one operates because one is in duty bound to do so, however grave one’s doubts. There is a chance—a very remote one—and therefore the patient must have the benefit of that chance. Sometimes it comes off, more often it doesn’t. In due course, gentlemen, you will operate for peritonitis. It is more than likely that the patient will die. Don’t let that discourage you, for probably the finest surgeon in the world could do no better. The chief thing you have to learn in the management of peritonitis cases, and it is a very difficult one, is to handle the patient’s relatives and friends. Your own inner conviction will be that the case is hopeless. They, too, will probably have the same opinion, but it is not your function to confirm it. Dealing with situations like this can only be mastered by experience. For all that, gentlemen, I sincerely trust that your experience of peritonitis cases will be as limited as possible.”

It was no overstatement of the position in those days, even though in the light of contemporary knowledge and technique

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they sound like an echo from a dark age of ignorance and despair. Peritonitis, like so many other conditions that were regarded as odds-on fatalities, now yields to prompt and efficient treatment. The young surgeon does not have to master the difficult art, referred to by my professor, of handling the patient's relatives with tact, for one can look them straight in the eye and say that the chances are at least even that the case will recover. A cure twenty years ago was regarded almost as a miracle; today a failure is the cause of much heart-searching on the part of the surgeon concerned. That is a measure of the progress that has been achieved.

Many times in my career I have recalled those words I have quoted on the subject of peritonitis. Nowadays they form a pleasant reassurance of the advance of surgery, but I can remember an occasion, some fifteen years ago, when I was fresh to practice, when they came back to me vividly as a statement of fundamental truth, though hardly as a consolation. For I was going through what must always be one of the most harrowing moments of a surgeon's career: the first loss of a patient; and it had been a case of peritonitis. On that occasion, not even the reflection, as the professor suggested, that the finest surgeon in the world could probably have done no better, serves to lift the weight of disappointment and even despair that sits on one's shoulders; when one is young and at the beginning, one has not the background of experience to see the event in its proper perspective—nor has one the confidence in one's skill that can come only with the passing of years.

But to describe the individual case. I was practising in the Midlands at the time, and I was called out about midnight to a patient whose condition, if the anxious, troubled voice at the other end of the telephone line meant anything, must be not far short of desperate. It was almost impossible to make out what was the matter; the man who was speaking to me confined himself almost entirely to appeals for speed and help. It was foolish to try to ask questions; the best thing

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was to drive out at once to see the patient, and this I did without further delay.

On the telephone the name A—— which had been given to me conveyed nothing, but as soon as I saw the man I found that I knew him by sight. He was an official of the bank at which I then had an account, and I had seen him many times at work in the branch, though, as he never did duty at the counter, I had never spoken to him. He was in a state of the greatest agitation over the condition of his wife, the patient; and as soon as I entered the bedroom I had to admit, in my secret thoughts, that his extreme anxiety was not misplaced.

The pain-racked woman in the bed presented an almost classical picture of an acute peritonitis case. Her face was tightly drawn and had a typical appearance of sallowness. The eyes were so sunken that the orbits seemed to cast dark shadows over them. Her breathing was quick yet laboured. It was a combination of signs that could not be mistaken, and the examination to which I proceeded at once could only confirm it. The abdomen was greatly distended, with a dry, unnatural skin, and the slightest pressure on it elicited immediately deep and agonized groans. And then, as if to make my diagnosis doubly sure, Mrs. A—— began to vomit in the characteristic way, of which it would no doubt be nauseating to give details here.

“Peritonitis,” I murmured to myself. My heart sank. Of the outcome I had no illusions whatsoever. The woman was dying already. But something had to be done and swiftly. I drew the husband aside and began to ask questions. His answers were typical of the false moves into which people are drawn by ignorance and reluctance to seek medical advice at once in case of obvious distress. It was not the first time I had heard a similar story, nor was it the last. Even in these more enlightened days it is still repeated to me with individual variations.

Three days earlier the trouble had begun. Mrs. A—— had been seized with sudden pain in her right side between the

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navel and the right hip. There had been vomiting and a slight rise in temperature. The only relief she could obtain was by doubling herself up with bended knees. Yet these danger signals were ignored—or, at any rate, underrated.

“Why didn’t you call a doctor at once?” I demanded angrily of the husband, when he had conveyed this information to me. “Here were all the signs of acute appendicitis, and you did nothing.”

“We intended to call a doctor,” he replied miserably, “if she had got any worse, but we tried a hot poultice and she took an aperient and the pain subsided. In fact she was able to get up and recommence working about the house. Naturally, both of us thought it was just some passing disturbance, and we were both very glad. If only I’d known!” he added in despair.

How often that disastrous “treatment” is applied! Instead of doing the obvious and prudent thing in calling a doctor, these two had resorted to poultices and an aperient, the last measures of all that should have been adopted. Of course, the husband had not been lying when he told me she had grown better. She had. In fact she had been cured. But it was a false cure that had merely dispersed one diseased condition and replaced it by another and more serious one. What happened was that the “remedies” had burst the inflamed appendix. The immediate outcome was relief. But in a few hours the dread sequel was well under way. The burst appendix had discharged pus into the abdominal cavity, and peritonitis had developed fast. Rapidly the patient went downhill. As she lay there, the end was already not far off; the poison from the absorbed pus was killing her.

Naturally, I did not tell the husband all this in as many words. I let him see, however, that the case was extremely grave and that he must not allow himself much hope. I do not know whether this would have met with the approval of my old professor as the best way to handle the patient’s relatives, but it seemed the only way in which the situation

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could be met. Nor did I remain idle and wait for the inevitable end. I made arrangements for Mrs. A—— to be removed to the hospital, where she was taken at once into the operating theatre.

Here I did what I could. The abdomen was opened and revealed a bad case indeed. Nearly a couple of pints of evil-smelling fluid were removed, and the intestine was so distended that it looked like a string of blown-up sausages. Finally, a rubber draining tube was inserted to draw off the remaining pus and any more that might form, and then the wound was closed.

The young house surgeon who had assisted me looked at me with a shrug.

"And what do we tell the old man about it?" he asked, knowing as well as I did that the case was hopeless from the start.

"Tell him to pray for her soul," I replied dejectedly. There was nothing more that could be done—except perhaps to put the funeral arrangements in hand.

Three days later the patient died. In vain I tried to console myself with the thought that her fate was sealed before I even knew of her existence. When one is young one is apt to take failure tragically, and the more inevitable that failure is, the worse it appears.

Peritonitis does not follow only from acute appendicitis. It may be a sequel of inflammation of the womb or a burst gall-bladder, for example. But however it is caused, the results are the same. Distension of the intestine occurs and the fluid from the patient's body is sucked into the bowel—which is the cause of the copious vomiting, so distressing and nauseating a feature of the condition. When death occurs, it does so from toxæmia, which is the technical name for what is popularly called poisoning.

Yes, it is a very terrible thing, but today the surgeon no longer fears it as he did; he does not approach such a case with a fatalistic readiness to accept failure already in his

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mind. Though he does not by any means take it lightly, he faces it with quiet confidence. He has new weapons in his armoury, and he does not feel that he is fighting a lost cause.

First of all there are new and better methods of diagnosis. Infected gall-bladder, infection of the womb, and acute appendicitis—the three chief causes, as I have said, of peritonitis—can be detected much earlier. That means that these conditions can be treated at once, and so the chances of peritonitis developing are rendered more remote. But cases do occur, nevertheless—most frequently from appendicitis. When the inflamed appendix is fulminating violently, it takes only a few hours for general peritonitis to develop, and then the trouble has begun indeed. Even then the surgeon—if not the relatives—can face the situation calmly.

Only a little while ago I was called to a case. The patient was a small boy, only ten years of age. He presented a picture that, allowing for the difference of age and sex, was a repetition of Mrs. A——'s fifteen years before. Yet tragic as her state had been, this was far more affecting. There is nothing so terrible as a child in great suffering. If I had seen such a boy fifteen years before, I would have been plunged into the depths of despair, for I should have known that a life was about to depart before it had barely begun. As it was, I experienced a thrill of joy as I turned to the parents and assured them that there was every chance of recovery.

The mother dabbed her red eyes and shot me a quick glance of gratitude. The father, on the other hand, nodded curtly, as though he would not dare to argue, though his own private opinion was the reverse of mine.

It was no time for argument in any event; the sooner the operation was performed the better; and the child was taken immediately to the hospital, where the theatre had been got ready for me. This time, unlike the A—— case, I did not immediately proceed to open the abdomen. The first and essential step was to insert a needle into the child's arm so that a blood transfusion could be made in order to replace

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the lost body fluids collected in the intestine. Not till this had been done was the incision made.

Now the accumulated fluid was carefully drained off, and it was then that I called upon one of the great discoveries of modern times that has done so much to alter the whole outlook in cases of this kind. Into the cavity penicillin and sulphonamide powder was poured—those magic agents that would fight and overcome the masses of virulent germs that were poisoning the child and trying to take away his young life. Attention was also given to the grossly distended bowel. A special rubber tube was inserted through the mouth into the stomach so as to maintain a continuous withdrawal of the infective fluid. So, at last, the wound was closed—but the final application of discovery was still to be made. Every five hours for the next three days the small boy would have injections of penicillin, so that there would be no respite in the war against the germs.

It was all so different from that operation of fifteen years ago. Yet, despite all the radical differences in technique, I think that the greatest change of all was in the atmosphere of the operating theatre. My assistant did not shrug his shoulders when the last stitch had been made and the patient was being wheeled away. I myself knew that I would not have to face the bitterness of defeat—the defeat that springs from helplessness. We were the masters of this child's fate—unless the million-to-one chance occurred and some inexplicable complication set in; but that is a risk one takes in all operations, even the simplest, and it is rarely more than a minute thought at the back of the surgeon's mind.

Nor was any of this confidence misplaced. In a couple of weeks' time the little boy was home again, completely recovered. There had been no need this time to advise them to pray for his soul. The shadow of the grave has been lifted from the peritonitis victim.

A little while later the father came to see me. He thanked me warmly, and expressed the view that a miracle had been

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worked. Quite obviously he felt, while openly praising my care and skill, that the real cure had been worked by an odd chance.

"You know, doctor," he said slowly, "I never expected to see Harry back again at all—at any rate not as a living boy. I thought he was gone before he was taken to hospital."

"It was certainly a bad case," I returned, a little sternly. "Why did you leave it so long? I could see, incidentally, that you didn't believe me when I told you and your wife not to worry."

"Yes," he rejoined. "I admit I did think that you were merely trying to be kind and reassuring, and to be frank I thought it rather unfair of you. I owe you an apology for that."

"There's no need for it," I interposed. "What I want to know is why you left him so long before calling in a surgeon."

He shrugged. "I had the local doctor in, of course," he said, "and he told me at once it was peritonitis. To be quite honest with you, I thought all that business of having an operation was just a grim farce. He had to die in any case, so why go through all that?"

"But why should you think that?" I demanded.

Again he shrugged. "My mother was taken in the same way," he answered. "She was dead in two days. We had the best surgeon available, but it made no difference."

"How long ago was that?"

He thought for a moment. "About twelve years," he replied. "Yes. I didn't want family history to repeat itself."

"Surgery has made great progress since then," I pointed out.

"So it seems—so it seems," he murmured, without much conviction; and his subsequent words indicated the way his thoughts were moving. "God has been very kind to me for saving my boy," he added.

"If you wish to thank God, don't do so for any special intervention on your son's behalf," I said firmly. "Thank Him, rather, for inspiring surgeons all over the world to find new and better ways of fighting peritonitis. Thank Him also

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for leading scientists to the discovery of the sulpha drugs—what you know, I expect, as M. & B.—and penicillin. It is those gifts of God which have saved your son for you, as they are saving almost everyone today who falls a victim to peritonitis. And if you pray, pray also that you won't let your mind be clouded by ignorance but that you'll be led to those who can help you and yours. If you had called in a doctor earlier, your boy might even have been saved the actual operation."

It was quite a little sermon, something I am not at all in the habit of delivering; and he stared at me in open-mouthed surprise.

"You are right, doctor," he said meekly. "Yes, you are right. If Harry had died, it would have been my own fault entirely. I can see that now. I am doubly grateful to you—first for your successful treatment of my boy, and secondly for showing me the error of my ways. I shan't forget it."

In a very thoughtful mood he went away. I learnt afterwards that he was a deeply religious man, and my spontaneous homily had, by chance, provided exactly the right approach to him.

It is true that, as I told him, some cases of peritonitis—or, more accurately, conditions that give rise to it—can be resolved by methods that do not involve actual opening of the abdomen, though the complete operation is probably the safest and best method. Obstruction in the intestine is a source of danger, and it is possible to deal with some kinds of such stoppage by means of a special kind of tube. This is about ten feet long, and though it looks like a single tube it is really two tubes side by side, like the twin wires in a piece of electric cable. One of these parallel tubes is an ordinary stomach tube with a suction cap, the other is provided with a small rubber swelling at the end like a child's balloon. This tube is passed down through the mouth till it reaches the obstruction, the correct position being determined by the use of X-rays.

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When it is properly placed, the balloon is inflated. What happens then is that the intestine grips the inflated part in exactly the same way as it takes hold of a food mass, and the action of the intestines—the peristalsis—which peritonitis interrupts commences, forcing the tube forward through the bowel. At the same time, the other part of the tube has suction applied to it and so evacuates the accumulated fluids and gases. In order to facilitate the introduction of the tube the deflated bladder is sometimes partly filled with mercury, so that its weight carries it down. The use of this tube in all cases of intestinal obstruction, no matter how caused, yields remarkable results, and its effect in cases of peritonitis can be nothing short of dramatic.

Peritonitis is no longer the scourge that it was. Modern surgery has brought it under control, and nothing demonstrated this more clearly than experience during the war, when the rate of fatal casualties due to peritonitis caused by stomach wounds was reduced to an amazingly low level. Immediate treatment is, of course, essential, and so it was that between 1939 and 1945 surgeons were performing in emergency theatres all over the world an operation that twenty years ago was regarded as practically hopeless even when carried out in a fully equipped hospital with the finest surgical skill available.

For us, in the dangers of peace, the moral is a simple and obvious one—and it applies not only to peritonitis but also to all the physical ills of the flesh. Today the resources of medical science are so vast that it is little short of criminal for a layman to rely on his own judgement and think that any condition is utterly hopeless. Early advice should be taken, and when this is done the chances of recovery, even in difficult conditions, are immeasurably improved. Despite all the powers of contemporary surgery and medicine, the greatest ally the doctor has is Time.

There are many reasons for the reluctance with which people seek medical aid even when their condition is obviously serious. Sometimes, as we have seen in this last case

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and in the case of tuberculosis described in a previous chapter, it is due to ignorance or misconception as to the capabilities of modern surgery. At other times it is fear of the surgeon's knife. This is perhaps understandable, though not wholly excusable; for if someone is suffering from some illness that can only be cured by operation, surely it is wiser to have it done early than to leave it until later, when the surgeon's task will be many times more difficult? As to pain, progress has eliminated a lot of it from surgery, and has also done away with a great many things that in the past have tended to make operations an ordeal.

Here is a case that shows how a man endured months of nagging pain simply because he feared the operating table more; also, it shows some other aspects of the resources of surgery today in dealing with abdominal conditions.

The patient came to me on a Monday afternoon, and as soon as I glanced at him I could recognize his trouble. To the experienced eye there are some states that present an infallible picture. This shrivelled little man was quite clearly in acute distress over his stomach. It was as plain as though he had already entered into a long and detailed description of his symptoms. Stomach trouble leaves a very plain imprint on a man's face. Though it is true that all suffering tends to be reflected in a changed facial expression, there are few that are so unmistakable as this. Some diseases share, as it were, an expression with others. Not so stomach trouble. It speaks in the plainest tones. It may be chronic indigestion; it may be an ulcer; it may be something more serious—no matter, the sign manual is there. And here was a typical example. His skin was pale and bloodless; his face was sallow and his lips dry. Even more characteristic was the furtive, haunted look in the eyes, as though he expected the worst to happen at any moment.

"Sit down," I said, drawing a new record card towards me. "There's no need to ask what you've come to see me about. It's stomach trouble, isn't it?"

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The little man—his name was H———opened his eyes in surprise. My diagnosis had obviously impressed him. More important still, it had done something to gain his confidence and banish his fears—for he had obviously entered my consulting-room with as much enthusiasm as an early Christian marching into the arena to meet the lions.

“You’re right, doctor—dead right,” he answered, licking his dry lips. “Yes. Terrible it’s been. Made my life unbearable.”

“How long has this been going on?” I asked.

“Eight months or more,” he replied. “Never really free from it.”

“That’s a long time to put up with such pain,” I commented. “Why didn’t you come before?”

H—— moistened his lips again and dropped his eyes.

“I was afraid, sir,” he answered, in a shamefaced way. “You see, I know you surgeons always like to operate, and I’ve never taken to the idea of being cut about. Of course, I took advice—good advice,” he added impressively. “I’ve been taking medicine.” He was very anxious to show that it was only surgery of which he stood in dread.

“Has it given you any relief?”

“Yes—and no, sir,” he replied slowly. “It helped for a bit, but the moment I stopped taking the medicine the pains came back again. I’m a fair walking chemist’s shop,” he continued with the faintest of smiles. “But it’s got to that state now, sir, when I can’t put up with it any longer. So my doctor said I’d better see a surgeon, and here I am. Of course, if you have to operate—well——”

He did not finish the sentence, but his meaning was plain. His voice had the philosophical resignation of one who regarded the operating theatre as the portal to the other world.

It was impossible to check the small sigh that rose to my lips. Like so many other sufferers from stomach trouble who had sat in that chair, he had come to me as a last resort, driven by a pain that refused any more to be controlled by medicine. I felt inclined to take him heavily to task and to

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point out to him that he had been making things more difficult for both himself and me, but a glance at his face checked my unspoken reprimand. It was the face of a man in exquisite agony. At least he had plucked up his courage at last to see a surgeon.

"Let me examine you," I said, stifling my emotions.

It did not take me long to make up my mind that nothing but an urgent operation would meet the case. His condition was the comparatively common one of gastric ulcer, which was suffering from lack of proper treatment. Owing to that omission, it had progressively buried itself deeper and deeper in the stomach wall with the passing months, and now it had reached the point when it was putting him in mortal danger. The signs of a perforated ulcer are not easily mistaken.

"Yes," I said, when he was back in the chair again. "It was certainly high time you came to see me. I'm afraid you must be operated upon—at once."

He almost leapt from his chair. His sallow face went even paler.

"At once, doctor?" he gasped. "*At once?* But that's impossible!"

I asked him why it was impossible—and he could produce no real reason. What was troubling him was his fear of the operating theatre. He had at last been persuaded to come to me, but foremost in his mind had been the hope that I would tell him there was no need for surgical intervention. This blow to his illusions had shattered him for the moment.

"There's absolutely nothing to fear," I went on. "I dare say you've got a lot of mistaken ideas about operations. There's nothing at all terrifying about them nowadays, you know. With modern anaesthetics and all the wonderful new drugs we use afterwards to prevent complications and infections, you've nothing at all to worry about. In your own case your chances are excellent. On the other hand, if you aren't operated upon, then I warn you there is everything to fear—everything."

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He was silent for a moment, and then, very slowly and with a slight nod as though in answer to his own thoughts, he spoke.

"Very well, sir," he said quietly. "If you really think it necessary, I agree. I leave it to you, sir. I—I don't think I could stand this pain for a day longer."

It was a complete *volte face*, which surprised me, until I remembered that the pain caused by gastric ulcers can be beyond human endurance. He had faced the choice squarely, and I admired him for it; his fear of continued pain—and perhaps worse—had overcome his dread of the knife.

But his resistance was not entirely broken. I made arrangements for him to be taken to hospital by ambulance; and this provoked an instant protest. He would rather take a taxi, or even walk, he insisted. If he went in an ambulance he would feel that he was a hopeless case. . . .

"Nothing of the sort," I observed. "You mustn't tire yourself, and I want you to be as restful as you can be. Besides, I'm going to do something to lessen that pain of yours for the time being."

This diverted his attention, and I gave him an injection of morphine before sending him on his way. There seems an idea that, in spite of the pain they cause, gastric ulcers are something one should not treat very seriously, in much the same way as toothache is something to be endured philosophically. I have known many cases of perforated ulcer, an actual danger to the life of the victim, who have stoically finished their day's work, often quite heavy labour, before going to their doctor. It is a curious prejudice that should be overcome, for delay can literally be fatal.

Two hours later I had commenced the operation. It is a remarkable paradox that, though gastric ulcer is a very serious condition, the modern operation for its treatment is simple and straightforward. An incision is made in the mid-line of the abdomen above the navel, and then, very quickly, the stomach can be located and the small hole in the anterior

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wall discovered. This was easy in H——'s case. Through the puncture a steady stream of fluid was spurting, consisting of the contents of the stomach, both the normal secretions and the products of his last meal. The hole is closed with a few stitches around it, arranged like the drawstring of an old-fashioned purse. A small piece of fatty tissue is then anchored over the wound to promote adhesions over the site of the ulcer and act as a precaution against a recurrence.

The chief time for worry is not during the operation but during the post-operative stage. Since there has been a discharge of the contents of the stomach into the abdominal cavity there is inevitably inflammation, which, without care, may lead to peritonitis. The intestine, too, is distended by an accumulation of gas, and this may promote paralysis of the whole gut, which may threaten life itself. This is known as an ileus, and it is only in recent years that satisfactory means of dealing with it have been evolved.

Use is made of the double tube—the Miller-Abbott tube, as it is called—which has already been described, and which drains off the fluid and gas, while also ensuring that the intestine and bowel are kept open. When I first saw operations of this kind, all manner of treatments were used, with little success, to ensure the conveyance of the contents of the alimentary canal. Irritant drugs were administered in attempts to stimulate the peristaltic action, and another method was to wash out the stomach by means of a tube—a procedure that, though it was reasonably effective, was distinctly unpleasant for the unfortunate patient.

H—— was treated with a Miller-Abbott tube, which was left in position for twenty-four hours. After that his recovery was little short of astonishing. Within ten days he was able to get about the ward and was helping the nurses bring food and medicine to the other patients more seriously ill than he was now. By nature he was extremely friendly and helpful, and he was quite ready to acknowledge that he had been entirely mistaken in his fears of surgery. Whenever I saw

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him he never failed to point out how ridiculous he had been and how completely he had been converted.

"You're not alone in that," I said to him. "I hope you won't keep it to yourself, because everyone ought to know how simple and safe this operation is, especially in this country under modern conditions. In England, one person in every three either has or is going to have gastric ulcers before he is fifty—and a lot of them suffer, as you did, because of their antiquated notions of surgery."

Of course, not all gastric ulcers perforate; and when they do not, surgical intervention is often unnecessary, for sometimes they disperse spontaneously or they yield to the usual medical treatment of taking alkaline powders after meals. None the less it is wise always to seek medical advice if indigestion persists for more than three days. There is no warning that should be more heeded than indigestion.

Even if ulcers do not perforate, they can give rise to other complications which modern surgery has mastered. When the ulcer forms near the passage, known as the pylorus, which leads from the stomach to the intestine, it may form a scar in healing which constricts the passage to a narrow opening, known as stenosis. Though not actually dangerous in itself, it prevents the sufferer from taking adequate amounts of food, which may in time become confined to liquids. So in due course undernourishment occurs, and this in turn promotes anaemia, loss of weight, and vulnerability to any disease that may attack the sufferer, owing to his lowered resistance. It may, too, reduce or even inhibit a man's capacity for work, with serious repercussions on himself and his family. In the end, these people have to come to a surgeon—whose task would be rendered much easier if only they would not wait until the condition has passed practically beyond control.

X-rays have made the detection of this and other stomach conditions much easier and more exact. The patient is given a barium meal, which is an emulsion containing the metal

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barium, which is opaque to the rays. From the shadow which this meal throws on the X-ray plate, the experienced eye can see almost at once if stenosis exists.

As for perforated ulcers, the surgical treatment is quite simple. Two methods are available. In one the affected part of the stomach is removed and the two ends are then joined directly together; in the other the actual stenosis, or constriction, is left undisturbed, but a bypass is formed so that the food can pass freely from the stomach to the intestine. The latter is known by the rather frightening-looking name of gastroenterostomy.

Age and physical condition provide no deterrent to this operation. Not so very long ago I performed it on an old lady of seventy-eight, who had been reduced to such a state of exhaustion that she had for some time been unable to leave her bed. For three months she had endured this before a friend persuaded her to come to see me. The examination showed her stomach to be closed so narrowly that only a little milk and water could find its way through the constriction.

Before she could be removed to hospital, she had to be given a transfusion of two pints of blood, which my anaesthetist and I did while she lay in her own bed. Then she was taken in an ambulance to the hospital. The operation lasted for three-quarters of an hour, and it is no exaggeration to say that in those forty-five minutes her life was given back to her. It was a year later that I last heard of her. There had been no recurrence of the trouble. She was able to eat whatever appealed to her, and, so far from being bed-ridden, she is able to walk daily in the garden.

Yet once again she went through a great deal of unnecessary suffering because of her refusal to have surgical treatment. She clung to an old belief that is unfortunately still widespread—that operations on elderly people are invariably attended by a very high risk. This is certainly not so when stomach operations are concerned. Indeed, the

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surgeon himself is often surprised by the remarkable recoveries made by elderly people submitted to the most testing treatment—recoveries that would do credit to those half their age. And there is no doubt that twenty years ago many of these successes would never have been attained.

About a year ago I was called in to examine a Mrs. M—— S——, an Italian woman, who was suffering from severe gastric trouble. The details gave her age as sixty-eight, and there was no reason to doubt the accuracy of the information; but when I saw her in bed she seemed to have shrunk to half the normal human size, and a guess of her age at ninety would by no means have been fantastic. The case looked pretty hopeless, with life at full ebb, yet there was one reassuring factor: her eyes were full of vitality and the will to live, and a patient showing those signs is always a good medical risk, as the insurance officers term it.

There had been plenty of hardship and toil in Mrs. S——'s life, as one of her sons explained to me when he outlined her history to me. At the age of thirty-five she had been left a widow in the First World War, in which her soldier husband had been killed while fighting the Austrians. Of her four children, the eldest, a boy aged fourteen, was old enough to earn his living, and he became to all intents and purposes the family breadwinner. Later, when he had grown up, he came to England with his younger brother, where, after much striving, they managed to establish themselves in business and slowly began to prosper. When war broke out in 1939 the three younger boys joined the British Army, but Luigi, the eldest, was rejected on medical grounds and remained at home to look after his mother and the growing business. The tide had turned. Luigi S—— was the owner now of several shops, and his ageing mother was able to enjoy a standard of ease and luxury she had never before known. It was then, as so often happens, that Fate struck her cruellest blow. Mrs. S—— was taken ill with great internal pain and eventually found herself unable to take

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any but the lightest food—and that in quantities barely sufficient to keep her alive. In vain her sons implored her to see a specialist, but she adamantly refused. That had begun two years before I was consulted about her—and now it seemed almost too late.

"It is a pretty desperate case," I said to Luigi, knowing better than to suppress the truth on this occasion. "I can operate, but I will not even be hopeful about the possible outcome. It is for you to decide."

Luigi looked at me. "If she lives or dies is in God's hands," he said. "For our part, it is our duty to do everything we can. You will operate, doctor, if we give permission?"

"I will do what I can," I agreed.

She was too weak to be moved to hospital. With the aid of an assistant I gave her heavy blood transfusions, and when she was a little stronger I arranged for a portable X-ray apparatus to be brought to the house. The information it gave confirmed my worst fears. In Mrs. S——'s stomach was a large tumour that had completely closed the entrance to the intestine. In effect, she was dying from starvation—and a grossly undernourished, elderly woman is not the ideal surgical patient. I sought out Luigi.

"It is even worse than I expected," I told him frankly. "The chances of recovery are practically nil. At best, her life may be prolonged for a few months, if that. More likely, I think, she will die on the table."

"Whatever happens," he said, paraphrasing his earlier words, "it be the will of God. We must do everything we can."

It was a desperate operation, for when the abdomen was opened fresh complications were discovered. Originally I had proposed to remove half of Mrs. S——'s stomach and make a new passage, and this was done. But I discovered something else: the gall-bladder was also blocked. This meant another operation, providing a new outlet for the essential bile and uniting the intestine with the gall-bladder.

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For three hours we fought a hand-to-hand battle with death, which was never far away. It remains a miracle to me that this old lady, weakened by a long period of virtual starvation, could withstand it all. And afterwards Luigi told me that he and his brothers, who had waited anxiously in an anteroom all the time, had given up all for lost; they thought I had not the courage to come out and tell them that their mother was dead.

Yet survive she did, as much—let me admit it—to my surprise as to everyone else's. But it was a long and trying fight to make good the unexpected victory snatched on the operating table, and it went on for three months. Time and again she had to be given blood transfusions, and recourse was had to every one of the many aids which modern science has made available to build up a patient's strength. Yet if there is any one basic explanation of her recovery I think it is to be found in her indomitable will to live, supported by the love and care of her solicitous family. It was that spark in her that modern surgery was able to fan back into flame.

Not long ago I saw her again. She was managing to get up and walk about a little, and I believe, in the absence of anything unforeseen, that she will enjoy at least a few more years of life.

That, of course, is an exceptional case; and again, one of those that need never have happened if she had been wise enough to take early advice. It is a rather remarkable reflection that twenty years ago she would probably have been considered quite beyond hope, even though she would then have been comparatively young; while at that time a woman of her age and in her condition would have been dismissed as inoperable. That is the measure of the advance abdominal surgery has made. In these days the knife is the stomach's best friend.

CHAPTER VI

Standing at Ease

In the days before there was a paper shortage, and magazines and newspapers seemed to consist very largely of advertisements, it was remarkable how many of the latter were concerned with patent medicines of various kinds; and an analysis of those advertisements showed that a very high proportion of them were extolling the merits of remedies for "indigestion" and "bad legs". Without commenting in any way on the value of these products, it may be said quite safely that the manufacturers knew their market. Stomach troubles, as we have seen, are likely to afflict one person out of three in the first fifty years of life. "Bad legs" are hardly less common. Like gastric ulcers, they are largely a product of our modern civilization and the unnatural strains it imposes on the human frame. By "bad legs", of course, is meant varicose veins and their complications, which are, alas! widespread and distressing.

The progress in dealing with complaints such as these is, to my mind, the greatest triumph of modern surgery. It is little consolation to a surgeon to know that he can cure some obscure and rare disease while he stands more or less helpless in the face of the most common ills of mankind--the ills that come to so many people and that, even if they are not serious in themselves, lead to lowered bodily efficiency and the constant nagging of uncontrollable pain.

Particularly in the case of varicose veins, those advertisements promising relief from "bad legs" were a bitter and

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by no means unjustified comment on the comparative inability, in bygone years, of the surgeon and physician to deal with the condition. Treatments existed, it is true, but they were far from satisfactory. Elastic bandages and stockings were perhaps the most popular remedy—if that is the proper term—and no one could call them more than a partially successful palliative. The surgical treatment was one that pleased no one, surgeon or patient. It consisted, when I was at the outset of my career, of pulling out the weakened veins, and, I think, was one of the most unpleasant of all interventions, either to watch or to perform.

Thanks to research and experiment and the quiet determination of surgeons to get to the root of the matter, the picture has now been entirely altered. Indeed, an American commentator has said of varicose veins: “. . . No condition is simpler to explain, simpler to treat, once the problem is approached, as should all surgical problems, logically, with full appreciation, first, of the anatomy of the veins of the lower extremities, and second of the hydrostatic pressure peculiarities which they, more than the rest of the venous system of the body, exhibit . . .” Yes, it all looks so easy, so obvious now, as most problems do when they have been solved. For the plain man and woman—and particularly the woman, for varicosities are far more common in women than in men—the thing that matters most is that real, lasting treatment and cure are available.

One of the curiosities of surgical practice is that though this condition is so common, cases seem to come to one in waves. For months, one goes without seeing a single patient of this kind, and then three or more come within the course of a single day. It is one of those matters that seem even beyond the skill of a statistician to explain.

Varicose veins affect all classes of the community, all professions and all trades. The patient may be a clerk or a waiter, a factory worker or a housewife, an athlete or a newly-married woman expecting her first baby. But there

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is no mistaking their condition as soon as they walk into the room.

Let us take an individual case. An Italian patient was announced, one A—— B——, who turned out to be a marble carver. He came into my room and I judged his age to be about fifty. But what interested me was his limp. It was characteristic of leg trouble; more than that it suggested one of two conditions—either varicose veins or sciatica.

I put him at his ease and began to ask him questions, particularly as to how long he had suffered from his complaint.

“Well, doctor,” he replied, “it’s like this. I stand a lot—on my feet all day, and the work is heavy. That’s what I think it is. All this standing. Now my leg is looking horrible. The veins, they are like big cords. Sometimes the pain gets so bad I have to knock off work and lie down before I can go on. That’s serious, doctor. I can’t afford to lose time. It has got so bad that I have come to see if you can do anything for me.”

It was clearly varicose veins. But he had not answered my question.

“You haven’t told me when you first noticed all this,” I observed.

“About two years ago, doctor. I did not think that mattered.”

The same old attitude! For two years he had allowed his condition to go from mild to bad and bad to worse, so that now it was unlikely that anything but a surgical operation could help him. If he had come to me at once he could probably have been cured without the need of so much as going into hospital. Varicose veins—“bad legs”—were looked on as something minor—and surgery was reserved for the bigger, more serious ailments. That is the common point of view, and it is one that cannot be too strongly condemned. Surgery is no longer a last resort, if indeed it

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has ever been in modern times since the days of Lister and the introduction of anaesthetics; it should be regarded by everyone as a first-line of defence.

In a very broad and general sense, varicose veins are an occupational disease. They are brought about by long hours of standing on the feet, and thus they are likely to affect all, from policemen to housewives, whose daily work involves these conditions. The explanation is quite simple. As everyone knows, blood is pumped under pressure round the arteries by the heart until it reaches the extremities. Then it returns to the lungs and heart by way of the veins. But the returning blood is not under pressure, and it has to make its way by crawling, as it were, along the blood vessels. The principal veins are enclosed in muscle that helps the return passage. But in the leg the conditions are difficult, for when one is standing the blood has to find its way upwards against the force of gravity. To aid this process the veins of the legs are provided with "valves" which prevent the blood from running back.

Now see what happens when a person stands for long periods. All the time the blood is trying to run downwards, and its weight tends to dilate and wear the vein structures. After a time the dilatation grows worse and the veins themselves become weaker. These are the varicose veins.

B——'s legs had been allowed to deteriorate into a very bad state indeed. The veins were about three times their normal size, owing to the accumulating blood, and the large, hard, bluish knots in them showed clearly through the skin. This condition is not only unsightly, it is also extremely painful and can be very dangerous. If the veins are untreated, big ulcers may develop and there may be haemorrhage through the partial bursting of the veins themselves when they are unable any longer to contain the weight of the blood. Though long standing is probably the most common cause of these veins, there are other predisposing factors. Thus, any disease that causes weakening of the muscles and hence

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loss of support for the veins may induce it, while unusual increase of pressure, such as occurs during pregnancy, may also initiate them. There is, too, some evidence that varicose veins—or, rather, a tendency to them—run in families.

I looked at B—— sternly.

“You should have come to me or another surgeon a long time ago,” I told him. “As it is, you’ve let things go much too far. I’m afraid there is no alternative to an operation.”

Though he did not like the news, he had been prepared for it, and he indicated his agreement with an air of patient resignation.

I went on to tell him that there was nothing to fear. The operation today for varicose veins is quite safe and simple. It so happens that most of the veins subject to varicosities unite in one big vessel known as the great saphenous vein, and the treatment consists simply of finding this large vein and tying it. The blood then finds a way through alternative vessels.

As a rule, this operation is effected under local anaesthesia, and this was the course I adopted when B——’s turn came. The incision, which is quite small, is made in the groin, and the scar itself, hidden away in the fold of skin, is usually barely noticeable. Once the incision has been made the saphenous vein is located, tied and severed, as are all the associated branches at this point. This does not complete the treatment, for what follows represents the great advance in modern methods. There are now available various substances which, when injected into the vein, obliterate it, making it impossible for blood to circulate any more through the treated vessel. Sometimes these chemicals are injected downwards through the incision made for tying the veins, but often it is more satisfactory to make a second injection over the saphenous vein on the inner side of the knee, where the vein is tied again before the substance is injected. A pressure bandage is then applied to force the walls of the vein into contact with each other. Finally—and this is why

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local anaesthesia is usually employed—the patient is made to walk at the earliest possible moment. The action of the muscles forces the injected solution deeply into the vessels, so that the excess is washed away by the blood stream.

It may seem strange that the first thing the patient is asked to do is to walk, but it is vitally necessary. Unless he does, there is a danger that the obliterating chemicals may go where they are not wanted into the deep veins and there cause complications of an undesirable kind. Sometimes, indeed, it is better not to inject at the time of the basic operation, but to leave it for a second intervention when the patient is more fully restored.

B—— proved a responsive patient. In his case I deemed it wiser to make the injection on a second occasion, but even so he was able to return to his work in three weeks from the time of our first consultation. He was delighted, saying it was a long time since he had been able to do a full day's work in comfort. Of course, I was glad of the success, but the fact remained that he had only himself to blame for the long discomfort and pain he had suffered. If he had asked for treatment in the early stages, no operation would have been necessary. The small dilated veins could all have been obliterated by simple injections and the spread of the condition arrested.

On the same day as B—— visited me, another patient came to see me, also with leg trouble. She was a young and attractive woman, married for about a year and expecting her first baby. Varicose veins were showing in her left leg, due to the abnormal pressures set up by the unborn child. But here neither operation nor injection was called for immediately. Simple protective measures were all that were needed, at any rate for the time being. My advice was that she should wear an elastic stocking and come back to me later for a re-examination after her child had been delivered.

At this second examination the varicose veins themselves had disappeared, but there remained three small nodules,

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which might prove a source of future trouble. The remedy here was straightforward. Injections were made, and after a few days' rest she found to her delight that she was perfectly normal again.

I have just said that simple protective measures were adopted for this young woman, and this raises the point whether it is possible for those liable to varicose veins to take steps to prevent their occurrence. Elastic stockings do help, especially for pregnant women, and there may also be something to be said for the popular female practice of slimming, provided it is done wisely, for accumulations of fat undoubtedly hasten the development of varicosities, and their incidence in fleshy women is high. Physical exercises are also a useful aid; such things as bending the knees sharply encourage the muscles to work smoothly in assisting the return flow of blood. Of course, it is widely known that tight constrictions, such as garters, should be avoided; they add an artificial handicap to the already difficult work of ensuring the return blood stream.

Yet none of these methods, nor all together, will effectively cut out all risk of varicose veins. Once they show themselves, advice should be sought; and if they are slight the mere wearing of an elastic stocking may do all that is necessary.

A varicosity is a point of weakness and therefore a possible source of danger. An accidental blow or cut may rupture the dilated vein and severe haemorrhage may result. Again, the vessels may, as I have already said, burst spontaneously under their own internal pressure. Such bleeding should be treated promptly by first-aid measures with a tight bandage improvised on the spot. The feet should also be raised till the haemorrhage is arrested. These are points that everyone should know, and they are essential if serious damage is to be averted.

Varicose veins are a constant worry and anxiety to many people, who fail to realize how much progress has been made in their treatment. Except in those of severe and prolonged

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neglect, there is scarcely a case today that cannot be cured, either by simple injection when the trouble has not gone far, or, best of all, by tying off the vein and combining this with the injection. The prevalent idea that varicose veins are practically incurable, and that once they appear they are there for good, is one of the most deplorable of all popular medical fallacies. Moreover, the treatment itself is quick, safe and sure, for quite apart from the progress in knowledge and technique the modern surgeon is able to guard against all complications that used to attend the old type of operation.

It is easy, as I have pointed out, to recognize at once that a patient has leg trouble—but not so easy at a first glance to decide whether it is varicosities or sciatica. Sciatica is also a modern scourge, crippling thousands with its excruciating pain; and here again there has been a remarkable improvement in treatment during the past twenty years. Indeed, it is only during the past ten years or so that medical science has found the way to bring this distressing condition under control. In my early days little was known of the fundamentals of the disease, and treatment was more palliative than anything else, through the application of heat, massage, and so on.

As soon as scientific attention was turned to the condition, however, some remarkable facts emerged. Patients could be grouped into classes, and it became possible to recognize at once which particular nerve was involved. The old idea that sciatica was an irritation of the whole sciatic nerve—a very complicated structure—was abandoned, for it was proved that in the majority of cases the trouble was based only on one or two of the roots that form the nerve.

Investigation led to the conviction that the trouble was caused by pressure on the nerve, caused by the displacement of some structure, and at last, after other possibilities had been ruled out, it was discovered that the pain was caused by a slipping of the ring of cartilage which forms a cushion

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between the vertebrae of the spine. The ring broke in places and permitted the soft internal part to burst through and come in contact with the spinal cord. The obvious remedy was to operate on these disks or rings.

This might seem a formidable undertaking, for it involves interference with the spine itself. But it so happens that it is not so serious as it appears at first sight. When the operation is performed, the spine is exposed by an incision placed low down and the heavy ligament surrounding the spinal cord is exposed. This is trimmed into a flap and lifted, and when the cord and nerve roots have been delicately moved aside, the irritant pulpy mass, like a crop of miniature mushrooms, can be clearly seen. A special instrument is used to extract the pulp, and finally the disk itself is removed. In the end, the vertebra slips back into position. Actually, for all its apparent complication, it is an operation that gives little trouble to either surgeon or patient, and the latter is usually able to get about again after a few days, relieved of the hitherto agonizing pain.

The third patient who came to me on that eventful day was a man of about forty, whose condition appeared to be extreme. He was almost doubled up with pain when he entered my room, and a few questions soon established that his trouble was sciatica.

Now, though the operation described is often successful, it is not always so, and one proceeds with caution in cases such as this. The same state can be induced by true inflammation of the nerve or any one of the other known causes of backache, such as arthritis. That is why specialist examination is always necessary. I decided that before operating it would be better to try alternative measures, of which several are now available. One of them is the injection of alcohol or a local anaesthetic into the nerve, which does much to reduce the crippling pain.

Here, however, I finally chose yet another method. The patient was put under an anaesthetic and then his leg was

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stretched. This also causes the nerve to extend, and very often the treatment is sufficient in itself. So, indeed, it seemed to have been in this case, for when he was discharged from hospital I heard no more of the patient for some three months. Then he came back to me, complaining that the pains, of which he had been free for some time, had returned in full force.

Obviously something more fundamental was needed, and I arranged for the man to be examined by X-rays. The photograph revealed that a small cartilage between two of the lower vertebrae had become displaced so that it was pressing on the nerve. Now there was no choice but to perform the operation already described—the development of which, by the way, is due to the patience and skill of a group of American surgeons—and in the end it had completely successful results.

One's legs are undoubtedly among one's most precious possessions. There is nothing more pathetic than a human being who is denied his natural means of locomotion. One should therefore take care of these valuable members, and realize that surgery has now made the problem of their maintenance very much simpler. Men and women who, through ignorance or prejudice, continue to suffer from varicose veins can lay the blame at no door but their own, for a complete, safe, and speedy cure is available. One would be rash to say that the same stage has been reached in sciatica, second only to varicose veins among the most common ills of the legs, but enormous strides have been made, and it cannot be long before it will be possible for everyone to stand happily and comfortably on his own feet.

CHAPTER VII

Fire and Frost

When Prometheus stole fire from the heavens and brought it to earth the gods were enraged, for they believed that it would make men their equals. So the ancients put the truth that it is fire, more than anything else, which has given man mastery of the world. It is, indeed, his greatest and most powerful servant. But also it is his greatest and most savage enemy, which even in these days he cannot control when once it bursts its bonds. Of nothing does it take greater toll than humanity itself. No one who has seen bad cases of burning, whether in civil life or in warfare, can doubt this. Indeed, of all types of injury, every one of us goes most in fear of fire.

A couple of decades ago, and even much less, there was every reason for this fear, for serious burning was something that surgery had not learnt to cure. Even if the victim lived, he was likely to be horribly deformed, so that he felt it would have been better if he had died. Some of these tragic human beings were reduced to savage caricatures of men, with faces that were little more than hideous masks and scars that twisted and distorted; and even plastic surgery, which was not without its triumphs twenty years ago, could do little in such cases.

There is one case from my earlier experience that invariably comes to mind whenever I talk of burns. Personally, it was tragic—but it has also another value in that it reveals how limited were the surgeon's resources at that time, and

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provides also a striking comparison with what can be done today.

It happened in 1930. The victim was a young peasant girl who had been working in the fields when she had been struck by lightning. The shock itself was not very severe, but her clothes caught fire, and she was terribly burnt all down her right side from the cheek to the leg. When she was picked up she was unconscious, and the peasant who found her in her tragic state did the obvious and wise thing—brought her straight to the hospital.

I have seen many cases of burning both before and since—during the war they became far too common a part of one's work—yet I think that none of all these impressed me so deeply as this early one. When the war casualties came to my hospital, ghastly though they were, one knew that they were not hopeless. In 1930 there was no such reassuring knowledge to buoy one up.

Yes, that peasant did the obvious and wise thing when he brought her to the hospital. But he had also done something else that was certainly far from wise. He had allowed the local "wise woman" to administer first aid—consisting of olive oil smeared over the affected parts and the application of a bandage that was utterly filthy. As I saw it, the girl was not very likely, in the most favourable circumstances, to survive her injuries. This ill-advised, yet far too common, treatment sabotaged what little chance she had; for it meant certain infection.

There was none of the treatments we have today available for this unhappy young woman. We knew quite a lot about the dangers of burning—for example, that if more than a third of a person's skin is severely burnt, survival is unlikely; but we knew practically nothing about what to do about it. It has been left to the past ten years or less for research to establish a reasoned theory and practice of burns.

As we examined the girl, my assistant and I exchanged glances. The same thought was in both our minds: it would

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be better for this poor creature if she died, as we fully expected that she would. But though a doctor may not infrequently have such thoughts when he is confronted with what seem to him hopeless cases, he must not act upon them. His duty is to do all he can to save life, for the whims of Nature are inscrutable, and often the seemingly doomed patient will survive, while the "good risk" will succumb for no apparent reason. A doctor must not gamble with life, nor must he ever regard his knowledge as complete.

There was little chance that we would overestimate our powers on that occasion. All we could do was to apply everyday dressings soaked in vaseline, olive oil, and similar greasy substances. Every time those dressings were stripped off the girl went through agony; and every time that thought "she were better dead" came again into my mind. The terrible sores festered and then began to discharge pus. Then at last I felt that the end was mercifully near. Yet so unpredictable is the behaviour of the human system in health and illness alike, that the patient literally refused to die. To this day, that is the only way in which I can explain her survival. Certainly, I would be the last to claim that my treatment contributed anything to her survival; indeed, in the light of what we now know, what was done was calculated rather to retard her recovery than hasten it.

For eighteen months the girl stayed in the hospital, healing slowly and painfully; and when at last she was discharged, she was barely a human being, for scars crippled and distorted her. Her neck was drawn up, as though by some strangling hand, to one side. Her right arm was almost immovable and useless. The chest and leg were covered with thick, bluish scar tissue. What place there would be for her in life, I could not even guess. Nature, I felt, had played a sorry trick upon her in endowing her with that tremendous determination to live that she had exhibited throughout her long treatment at the hospital.

This was no isolated case at the time. All burns were

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treated in that way, and the results had a depressing uniformity. Yet it was the end of the phase of ignorance and helplessness, and, in fact, I believe that that girl was the last one to be treated by the old methods in that hospital. In America, strikingly successful results were being obtained with tannic acid, later to become world famous and later still to be abandoned. The age of effective treatment was dawning.

But before going on to look at these up-to-date means of making good the ravages of burns and scalds, let me try to answer the question why burns are so serious. I have said that if more than a third of the area of skin on a human body is destroyed by burning, the outcome is almost always fatal. Several explanations, none by itself wholly satisfactory, are available for this. One is that the burnt skin itself produces poisonous substances which pass into the blood stream and so induce a state of profound shock. The patient does, indeed, show all the signs of extreme shock. The pulse is very rapid and shallow; the temperature of the blood becomes dangerously low; the lips become cracked and dry. All these signs, by the way, were shown by the peasant girl. Another explanation is that the burns damage or destroy the small capillary blood vessels, so that the victim is robbed of the blood plasma which is essential to life. Apart from whatever infection there may be, the patient in effect becomes dehydrated, and dies from causes almost exactly similar to those of acute and prolonged thirst. These are only two of the theories held today, when the position is almost reversed from the state of knowledge fifteen years ago or so. Then, as I have said, we knew a lot about the dangers of burns, but little about their treatment; now, though our theories may not be complete or convincing, we do know the proper treatment.

Tannic acid looked at the time to be the answer to the problem of burns for which medical men had been searching for centuries. One of my earliest experiences of its use occurred soon after I had settled in this country and was

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practising in the Midlands. A small girl was brought to the hospital suffering from severe burns. She had been playing too near an unguarded fire in the kitchen, where she had been left alone, and her dress had taken fire. Her screams did not attract attention from a neighbour until very severe damage had been done. It was a tragic enough case in its way, perhaps not intrinsically so shocking as that of the peasant girl, yet all the more affecting because a small child was concerned.

But this time I did not feel so helpless or entertain thoughts that it would be better for the victim to die. There was tannic acid—and therefore there was something more than hope. The method was comparatively simple. After the child had been put lightly to sleep under an anaesthetic, the burnt skin was thoroughly cleaned, and when this had been done the tannic acid was applied as a spray over all the burnt areas. Rapidly the tannic acid solidified into a leathery black covering. The idea was that this would neutralize the infection and immobilize it in the applied skin so preventing it from spreading through the body.

Once the shell of tannic acid had been applied, there was nothing more to do but keep the patient warm and under observation to make sure that no local or general infection began. Luckily, this case was successful. Gradually the black crust peeled off, revealing a clean, healthy new skin forming underneath. In a comparatively short time the child was discharged, none the worse off, at any rate so far as appearance was concerned, for her nerve-racking experience.

Like so many innovations for which great claims have been made, tannic acid did not prove itself the complete solution for the treatment of burns. As experience was gained with its use, so its deficiencies were revealed. In some cases, while the crust did seal off the infection and prevented its spreading, infection continued to develop underneath, with results that were sometimes fatal through lowering the patient's condition, always bad in severe burning. Another

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drawback was that it did not prevent heavy scarring in bad cases. More victims might survive when tannic acid was used, but a considerable proportion did so only at the cost of deformity. Yet the treatment held the field for quite a long time. Even at the outbreak of the second World War, it was still the official standard. The grim experiences of the war, which produced so many extremely bad cases of burning, especially among airmen, quickly showed that something better was needed.

Other substances were tried, notably various dyestuffs, among them the gentian violet which became familiar during the war. But research was delving more deeply into the problem. Its lessons pointed to the need for replacing the lost blood plasma and other body fluids. Treatment, in fact, was becoming more fundamental.

Today the use of crust-forming materials is, to all intents and purposes, abandoned. The blood plasma is restored by transfusions, so that the patient's own natural defences have a chance to get to work. Infection is combated with penicillin, either by itself or in combination with one or other of the sulpha drugs. An entirely new technique of dressing has been adopted. Onto the burnt areas heavy, layered dressings soaked in blood plasma are applied, and the bandaging is done tightly and evenly. The burns are, in fact, treated in much the same way as surgical wounds. The patient is no longer subjected to all the shock and discomfort of having the dressing changed frequently. On the contrary, once in position it is left there, sometimes for as long as ten days or a fortnight. Meanwhile the plasma transfusions are maintained, and frequent injections of penicillin and sulpha drugs are administered. If the face is involved, the head is covered by a thick wad of dressings, with holes left for the mouth, eyes and nose. Under such treatment the burns heal well and cleanly.

As a result of these methods the mortality rate for burns has been reduced almost to vanishing point, unless, of course,

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some vital organ itself has been destroyed. The horror of burning remains—true ; but no longer is there added to it the further horror of knowing that little or nothing can be done.

These new ways of treatment have undoubtedly been highly successful, as the war record shows. But by themselves they do not solve the problem of avoiding the formation of ugly and deforming scars, which are particularly likely to occur on the face and arms. It is here that the plastic surgeon has come to the rescue—not, as some people imagine, by waiting for the burns to heal and then undertaking a reconstruction, but by playing an active part in the treatment almost from the first.

Of course, the old method was for the victim to wait for months for the scars to form; he then went to a plastic surgeon who began all over again by excising the scars and grafting skin to cover the affected areas. Nowadays the plastic surgeon gets to work at once. The damaged skin is cut away as part of the initial treatment and the new skin is grafted into position, so that as the burn heals the new skin takes the place of the scar that would otherwise form. For this, skin from the patient's own body is the best. Extremely ingenious instruments have been devised to shave off a layer of skin in a single piece as large as ten inches by five inches—fifty square inches of skin of transparent thinness!

As a rule, this graft is begun a few days after the occurrence of the burn, though sometimes it is applied earlier. The whole is covered with the indispensable penicillin powder, and then very firmly bandaged. This dressing is not removed until it is clear that the natural restorative powers of the body have done their work. Perhaps after ten days it can be taken off, and then a beautiful area of fresh, new skin is revealed. If the area has been large, it is quite likely that there may be little islands where the graft has not taken, but this does not mean that the operation has been unsuccessful. It is an easy matter to make fresh grafts over these places.

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I remember one case during the war of a Royal Air Force pilot whose aeroplane crashed in flames and who was very severely burnt about the face. He had been wearing his flying helmet at the time, though without the mask, and the disastrous effect had been that the whole of the skin on his cheeks, nose, chin and forehead had been burnt off. The method just described was used. Today that young man is perfectly normal in appearance—except that, on a very close inspection, a very faint white line can be seen in a strong light marking the boundary of the graft—and, incidentally, outlining the edge of his flying helmet.

It was the many war cases that did so much to improve the whole technique of burn treatment. While plasma dressings as described are probably the most usual method, there are others, one of the most successful being due to a British surgeon. He found that consistently good results were obtained if a burnt limb was enclosed in a rubber bag through which circulates a solution of bicarbonate of soda or some similar fluid. This is constantly renewed by a tube, and so the affected areas are continuously irrigated with a weak disinfectant. Wearing this bag—the Bunyan Bag, as it is known, after its originator—the patient is not subjected to any particular discomfort; he can even work with it in position. A transparent window is provided so that the progress of healing can be kept under observation without the need for disturbing the bag and exposing the burnt tissues to the dangerous air. Many war casualties owe their seemingly miraculous recovery to the use of this bag.

It seems a far cry from the terrible injuries caused by burns to the hardly less distressing—though in this country far less common—damage done by frostbite. Yet there is a very close similarity between the two classes. In frostbite, the tissues are damaged in much the same way, the agent being extreme cold instead of extreme heat, and blistering occurs just as in burning. In very cold countries, frostbite can establish a hold almost instantaneously, and the victim

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can lose a whole limb, which simply sloughs off. When I was quite young I remember seeing in Russia soldiers whose toes were lost in this way.

In England, such sudden frostbite does not occur. There is instead a slow freezing of the toes and fingers and the formation of blisters. Nothing is more disastrous in such cases than the application of heat. The classic method, discovered no one knows when, of rubbing the affected parts with snow remains one of the best. It ensures that through friction the temperature of the tissues is gradually raised. The modern hospital treatment is, in effect, simply a scientific adaptation of this first-aid measure brought under exact control. The damaged limb is encased in a cradle provided with cooling apparatus, the temperature of which can be exactly regulated and slowly and progressively increased till at last normal blood heat is restored and the circulation can resume its work.

Frostbite is comparatively rare in Great Britain; certainly those in the southern parts of the country seldom encounter it, even in unusually severe winters. But there is an allied complaint that is, unfortunately, very prevalent: chilblains. These can be painful and irritating at the best of times. Treatment today takes much the same course as for frostbite, but the wisest way of all is prevention—something that lies more within the province of the physician than the surgeon, for the treatment consists of the administration of concentrated vitamin products either by injection or in the form of tablets or liquids.

In conquering burns, surgery has undoubtedly achieved one of the major triumphs of its long history. Who can say how long man has been the helpless victim of the fire he has sought to make his slave? Archaeologists tell us that anthropoid creatures barely worthy of the name of man used fire in their caves millennia ago. It is an arresting thought, against that background, that it is only in the past ten years that he has found the knowledge which enables him to say that, if his servant can injure, it can no longer kill.

CHAPTER VIII

A Fight for Arms

Comparing surgical techniques of today and yesterday is so interesting, and provides so many startling indications of progress, that one is apt to become dazzled by details. The brilliance of the operation, the certainty of the result attained, in themselves seem to provide both the end and the means. Yet this is, I think, a false view. Underlying all these advances there is something more important and fundamental. Steadily, for many years, but especially over the last twenty or so, the whole approach of the surgeon and the function of surgery has been undergoing a radical change.

Let us look at it this way. When I was a young surgeon my profession was still regarded by most people as a court of last resort. The surgeon was the man who applied the last desperate remedy that might possibly cure the desperate disease. That attitude is changed and is changing rapidly. For today the surgeon's aim is conservation. He does not seek simply to remove an infected or damaged part of the body and establish some means or other by which the general functions of the system can carry on with more or less efficiency. He seeks to save. His aim is to send back to the world a sufferer in a condition as near as possible to that of a normal healthy human being.

Moreover, the modern surgeon interprets that phrase "normal, healthy human being" in a very wide sense. He is not content with so arranging things that the patient can

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live. He wants him to live as closely as possible to the pattern that Nature has laid down for him. Nor does he feel satisfied with sending out a patient who shows undue traces of the surgeon's handiwork. The influence of the plastic surgeon has been felt over a large field. The old days of large, unsightly scars are passing, if they have not passed. If a scar is large and prominent, it *may* be due to bad surgery—for there are, let it be admitted, bad surgeons even today—but it is more likely to be due to the fact that no other course lay open. The surgeon thinks long and deeply and explores every possibility before he undertakes an operation that is going to disfigure the patient.

In a phrase, the surgeon sees himself today as a healer and reconstructor in the fullest sense. The more his skill increases, the wider the range of techniques perfected for his use, the more he can achieve his aim of re-establishing normal human beings. It is the pursuit of this aim that had led him to such spectacular operations as those on the brain, heart and lungs—the very foundations of human existence.

The best way to bring this out is, of course, by practical examples. I can recall out of my own experience two cases that do vividly illustrate how far surgery has progressed towards its goal of restoration and conservation. They are the more striking because, with an interval of some ten years between them, they are concerned with injuries almost precisely similar.

One of the earliest patients who came to see me after I had begun practice in Harley Street in 1935 was a girl who gave her age as nineteen. She had been sent to me by a doctor with whom I had had many pleasant contacts when I had been in the north, and who had now moved to London.

She was a quiet, attractive girl, obviously of the "open-air" type, and I was not at all surprised when she told me that a few months earlier she had had an accident while playing lawn tennis in one of the more important hard-court tournaments.

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"What happened?" I asked.

She shrugged her shoulders. "What's happened often enough before," she replied, "but this time I wasn't so lucky. It was a terribly wet day—the whole meeting was held up by rain—and in my opinion the courts were dangerous to play on, but the referee decided they were all right, and we got on with the game. I was playing in the second round of the singles, and my opponent and I were like a couple of cats, the way we picked our way about the court. I don't know which of us was the more scared. Well, in the end, I came a cropper. I forgot the conditions in the heat of a long rally and went all out to retrieve a deep drive she'd angled right across me. I slipped and came down with a crash on my elbow. The pain was exquisite. The first-aid man came rushing up, and he sent for the medical officer. In the end they found I'd fractured my left elbow, so I was rushed off to hospital."

"I see. What happened then?"

"The hospital said there was nothing to worry about. It was a perfectly clean fracture, and I was obviously in a good state of health, and they said I'd be out in a few weeks—as I was. I've nothing to complain of about them."

"Let me see the arm," I said.

She took off her coat and revealed herself in a short-sleeved frock which made examination of the limb easy. The fracture had clearly set well, but I was quite prepared for the rest of her story.

"You can see for yourself, Mr. Sava," she said, "that that arm isn't right. It's shrunk. Oh yes, I know tennis players are supposed to get unequal development of the arms, and the right arm is supposed to be bigger than the left. But tennis isn't my only interest. I row quite a lot, and that was a good arm once." She smiled quizzically. "But it's not now. I've hardly any strength in it at all, and you can see it's thin and weak-looking altogether. At first I thought it was due to the fact that it had been cased up in plaster of paris for

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quite a time. But the weeks went on and it didn't get better, so I went back to the hospital."

"What did they do?" I inquired.

"They gave me electrical treatment and massage and told me to do remedial exercises—which, frankly, I thought rather silly, because what was worrying me was that I couldn't do my exercises properly." Again she smiled in that odd way. "Nothing did any good. So I asked the doctor to recommend me to a specialist, and he's sent me to you."

I had another look at the arm. She had hardly exaggerated when she had said that the arm wasn't right. It was very far from right. In fact it was almost paralysed. The external muscles had atrophied to thin bands. The condition was almost obvious, but I did not want to tell her at once. What had happened was that in the accident one of the nerves had become involved and been severed. This had not been recognized at the time—it is often not easy to detect in cases of straightforward fracture—and now the nerve had degenerated, with the result that her arm, to all intents and purposes, had become useless. The nerves nourish the muscles. When the latter are deprived of their nervous stimulus, they shrink and paralysis occurs.

It was a comparatively simple thing to arrive at the diagnosis. To suggest some sort of treatment was, in the then state of knowledge, impossible. Surgery stood helpless in the face of a nerve injury of this kind. I had to face the difficult task of telling the young girl the truth, for it would have been cruel to attempt to disguise it from her. At best some alleviating measures might be tried, if she wished; but that was all.

"You must be prepared," I said slowly, "to face some rather unpleasant facts." After I had outlined the state of affairs to her, I continued: "You see, there is very little that can be done about it, and it would be unfair to suggest that I could do much to help you. Broken bones can be mended. In these days it is even possible to graft bone and skin and

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muscle, but nothing can be done for a severed nerve. One of the vital communications in your body has been damaged, and now it is, to all intents and purposes, dead."

She took it well, but I could see that she was desperately disappointed.

"Thank you for your frankness, doctor," she said in a low voice. "I do appreciate it. But—but is there absolutely nothing to be done?"

I shook my head. "Nothing that carries with it the slightest hope of restoring your arm to its former state," I replied. "If you wish, I can try certain treatments that may give you a little more freedom, and so on."

"Then do please try, Mr. Sava," she insisted. "I shan't expect much. In fact, after what you've said I shall expect nothing. All the same, just a little improvement would be something."

Several treatments were, in fact, adopted, but the results were only slight. At nineteen, through an accident that should really never have happened if a tennis tournament referee had not decided that it was more important to adhere to his programme than to think of the safety of his competitors, she was condemned to be virtually a cripple all her life. To her it was a specially hard blow to bear. There would be no more rowing for her; there might even be no more tennis, for though she did not need her left arm for playing, since she was a normal right-handed person, a tennis player uses the left arm for balance, and I doubted if she would be able to extend it for any length of time.

That was one of the less pleasant cases of my first days in Harley Street. It is always hard to tell a patient that nothing can be done for his case, and it is doubly so when a young man or woman, on the very threshold of adult life, is concerned. Yet I had stated no more than the truth, as it was then; her condition was beyond surgical help as we knew it, despite the fact that all the resources of the greatest capital in the world were at our disposal.

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The complete contrast to this case occurred during the latter part of Hitler's attack by flying-bombs on this country, almost exactly ten years later. It is specially interesting, for it shows how far surgery had advanced and what could be done then—and now—even under the intense strain and restrictions of the civilian casualty service. There was not overmuch time in those strenuous days to concern oneself with the niceties one preferred to observe in private or ordinary hospital practice. When every moment counts, not merely for the case on the operating table but also for those desperate casualties who are awaiting their turn, the higher subtleties of surgery have to be reluctantly forgotten.

Once again the patient was a girl, but much younger than the former one. She was, I think, about fourteen. Yet, for all her youth, she was brave and self-controlled. Even though at moments her fresh young face was clouded, she managed to give me a smile when I began to examine her injuries.

To describe them as terrible is no overstatement. Hers was one of the worst cases of arm damage I had seen even during the height of the 1941 blitz. The arm had not been crushed, it was truc, and crushing injuries are specially shocking, but it had been lacerated throughout the entire length from shoulder to wrist. Ugly splinters of bone were projecting through the skin. Not only were the bones fractured in several places, but the nerves were badly torn, and some, it was clear even at a first glance, would have to be cut out altogether as useless.

Here was my earlier case over again, but in a more drastic form. The arm itself might be saved, but it would be paralysed. There was no time to lose, and I could not allow myself too much thought. The problem was whether it should be amputated or not. Remembering the earlier case, I wondered if perhaps it would not be better to take away the arm completely. It might be easier, I thought, to have one useful arm and nothing else than to possess a paralysed

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limb that would be a constant reminder of infirmity and past suffering.

While I stood bending over her, trying to make up my mind, the girl smiled faintly again; and her words seemed to indicate that she had read my thoughts.

"My arm," she muttered. "Please—please—you won't take it away, will you? I would rather die, really, if you can't save it. You'll save it so that I can play the piano again, won't you? It—it means everything to me."

I could feel that she was talking out of the depths of her sincerity. Clearly, her piano-playing meant something more to her than a polite social accomplishment. And her appeal, coming as it did so earnestly from a girl who was little more than a child, went straight to my heart.

Surely, in 1945, surgery ought to be able to meet a situation like this. Elsewhere surgeons were working miracles in restoring men's faces, saving others on the battlefield from a death that would have been certain ten years earlier. And as though the thought had been underlying all my reflections, there suddenly came to the surface of my mind the recollection of an article I had studied recently in one of the medical journals.

This had described how a leading Russian military surgeon had met with considerable success in grafting nerves derived from dead bodies onto living people who had suffered nerve injury. The technique was then still largely experimental, but the results had been more than encouraging, though there had, of course, been a proportion, but only a small one, of failures. Moreover, the method was quite simple. All it involved was introducing a piece of dead tissue to bridge the gap between the ends of the severed nerves. This provided a means whereby the opposing ends of the living nerve could, as it were, reach out for each other and again unite. The requisite for success was that the grafted tissue should be obtained from a freshly dead body. Grimly I noted that there would be no difficulty that night in meeting that

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condition. Casualties had been heavy in that particular incident.

Again I glanced at the moaning girl, who was still muttering to herself about her arm and her pianoforte. It was a pathetic sight—but I could not permit myself the indulgence of contemplating it. Hers was not the only case I would have to deal with that night. And I remembered that the case before hers had been one of a young man brought in as a priority casualty, though he was quite beyond human aid and had died before even the examination had been finished. I felt that Fate was pointing her finger inexorably and I must go the path it pointed out.

In a low voice I gave a few quick instructions to my assistant. His eyebrows shot up in amazement, but he said nothing. His impatience had been visibly mounting while I had been considering the case—which no doubt seemed to him to cry out for an immediate amputation—and I think he was eager to get busy again, even though what I proposed must have appeared, especially in those circumstances, as sheer madness to him. Without a word he sped away to obey my orders.

I could have wished there had been time to re-read that article so as to make quite sure of the technique the Russian had found successful, but that was impossible. There was nothing else but to rely on my memory. Basically, it was simple. Practically, however, there might be difficulties which I could only discover by experience.

During the operation there were one or two moments when I regretted my decision—moments when I could have cursed myself for allowing a girl's words to persuade me to enter this unexplored path. For the operation was by no means as easy as I had imagined it to be. Yet in the end it was done. I heaved a sigh of relief, which was echoed by my assistant, who had followed the whole of the proceedings with deep attention and interest, though also with obvious suspicion. He told me afterwards that it had hardly seemed to him a time for experimental procedures.

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Of course, even when the nerve was grafted, the work was not over. All those terrible lacerations had to be dealt with, but though they were extensive the work was quite straightforward and all too familiar in those trying times. We had penicillin available and there was no need to fear infection. So far as that part was concerned, it was mere routine.

Few of those wartime civilian casualties can, I believe, have been watched over and studied with greater anxiety. For eight long weeks that seemed endless, we waited and wondered. The great question had still to be answered: Would that arm show signs of returning normality, or had I in my rashness denied her the possible chance of an artificial arm and instead cursed her with one that would be paralysed for life?

The great moment came. To discover whether the graft had taken, electrical stimulus was applied to the muscles. If there was some reaction, then the operation would be judged successful; if there was none, then the nerve had failed to unite and the muscles would be degenerating. I could scarcely believe my senses when, on applying the electrical stimulus, the muscle contracted feebly. The long shot had come off. The nerve was revivifying itself. And from then on the record was one of slow but continuous progress. Stage by stage mobility returned to the limb, until, at the end, it was in every way normal. But for a small scar on the forearm, there was nothing to remind her that the use of her arm had once hung on a hair—and the behaviour of a piece of nerve fibre taken from a young man unknown to her.

During the period when the girl was undergoing her course of massage and exercises I spent considerable time in conversation with her and her mother, in the course of which her story emerged. From a very early age she had shown something more than a talent for the piano, and she had taken it for granted, even as a small child, that she would become a professional. Everything she did was concentrated on fulfilling that one ambition. When her schoolmates played

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tennis or hockey or netball, she would spend hours in the practice-room. The loss of her arm would have been something more than a physical disability to her; it might well have occasioned a psychological shock that could easily have wrecked her life. Not long ago, at the age of seventeen and a half, she gave her first public recital, and in reading the critics' notices, I felt that I had played a part, through the resources of modern surgery, in saving something more than an arm.

In all my experience, I do not think there is a more compelling demonstration of surgical progress than that provided by these two cases. The earlier one involved only slight injury, as these things go, yet it led to a life of semi-crippledom at best. The later one was a serious case for which, only a couple of years earlier, amputation would have seemed the better, if not the only, course. Nothing does more to show that, step by step, surgery advances towards the ideal not merely of saving but restoring to normal. In the face of such things one cannot but feel both proud and humble.

CHAPTER IX

Eyes to See

Despite the wonders that are worked by the surgeon today in operating on the heart and the brain, the eye would, on first thought, seem to be beyond anything but the most superficial treatment. For, delicate though the heart and brain are, and great though the risks may be in interfering with them, the fact remains that they are sizeable structures, and there is some margin for error, small though it may be. The eye itself, however, is relatively minute. If a surgeon is to take his knife to the eye, one of the most marvellous of human organs, he must be very, very sure of himself. He has to be certain that he can work with absolute precision, allowing himself not the slightest chance of misjudgement.

The eye is, too, an extremely delicate structure. A small piece of metal may easily destroy its function. It is soft and not very well protected. The scope of surgery of the eye might well seem to be limited to fairly drastic procedures in extreme cases when the possibility of saving sight has been abandoned.

That, indeed, was much the attitude until very recently. If I think back to the state of affairs in my early days, I single out a case that occurred in 1929, when I was in the final year of my courses of study.

It was one of a fairly commonplace kind—the sort of thing that happens not at all infrequently in industry, and, though for different causes, during war. A porter at the hospital in which I was working was handling some carboys of sulphuric

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acid intended for the laboratories. He was carrying one of them when he slipped and the corrosive acid spilled all over the place. Ordinary acid burns of this kind can be quite serious, but this man was doubly unfortunate: a few drops of the liquid spurted into his eyes.

In one thing he was fortunate. He was right on the spot for immediate treatment, and he was rushed at once to one of the ophthalmic specialists attached to the hospital. At first, despite the seriousness of the damage, the prognosis was favourable. The specialist did not think that his sight would be permanently injured. But this opinion was based only on the extent of the actual injury to the eye. It did not take into account the complication that set in later.

As the damaged tissues repaired themselves, an ugly scar began to develop in the cornea. This is the transparent part of the eye covering the eyeball—the window, so to speak, through which we see the world. The scar continued to thicken, and each day the unfortunate man's sight became a little worse. It was as though a thick, heavy curtain were being drawn across his eyes. The world he knew was gradually fading from him. The specialists did all they could, but they knew they were fighting a losing battle. He would never be fit for work again at the hospital, if nothing worse befell. Two years later he had become so blind that not only was he unemployable, but he had to rely upon the services of his children and neighbours to lead him about when he took a walk.

"I only wish," he said bitterly to me, "that I'd had a really nasty accident and it had killed me. I've always feared blindness, and now I've got it."

Yet he had had the finest treatment available at the time, for that hospital was very proud of its ophthalmic department and had enlisted the services of specialists whose names were well known far beyond their immediate circle. Moreover, that treatment had been applied promptly. If medical science could have saved his sight, it would have been saved. But medical science had been presented with a

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problem it could not then solve, and, furthermore, one that appeared likely to be always insoluble.

Would that unfortunate man have stood any better chance today? Would the sight he so much valued have been restored to him if it had been 1949 instead of 1929?

The answer to that question is best told by an experience I had only a few weeks before I sat down to write this chapter. At the invitation of one of the leading ophthalmic surgeons in this country, I was paying a visit to one of our largest eye hospitals. My friend had told me he was going to perform an operation in which he felt I might be interested. It was a chance not to be refused, for there is nothing a surgeon likes better than to see other surgeons at work in their own specialties—especially when they lie right outside his own sphere.

The case bore a certain resemblance to that of my student days. In this, however, the man was younger, being no more than twenty-five, and he was employed as a night watchman on a large building contract. During the course of his rounds he had stumbled into a lime pit, and his eyes had been severely burnt. Though I had read a lot about progress in eye surgery, I myself felt that this must be a fairly hopeless case. This view was obviously shared by one of the students of my friend the ophthalmic surgeon.

"He'll be blind for the rest of his life, I suppose," the student said. "There's not much to be done, is there, sir?"

The surgeon shook his head. "There you are wrong," he remarked. "In cases such as this the procedure is to graft a piece of fresh cornea to replace the damaged structure. To all intents and purposes that restores the eye to normality."

"Yes, sir," insisted the student, stoutly maintaining his attitude. "I know from your lectures that that can be done in some cases. But the snag is—where do you get the fresh cornea?"

"Sometimes," replied the surgeon patiently, "wives, brothers, fathers, mothers offer a piece of their own cornea."

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They can afford to lose a piece, if their eyes are healthy, without impairment of their vision. But there are other sources, of course, and they will be drawn upon for this case. In my last operation, as you saw, I operated for tumour at the back of the eye. The patient had lost his sight, and the actual loss of the eye itself means nothing to him. In fact, as I told you at the time, the only course open to me, if life was to be saved, was to take out the whole eye as well as the tumour. The cornea of that eye is normal and healthy and will serve for this operation."

Eye grafting is a very delicate and highly specialized technique, and demands the most careful preparation. The patient has to be very carefully prepared, and extreme dexterity is needed when the actual graft is placed in position and secured. The size of the graft is so minute that it seems almost impossible for human fingers to handle it. Rarely is it more than five millimetres across—say one fifth of an inch—and often it is even smaller. One of the most interesting and fascinating phases of the whole operation is the placing of the suture or threads by which the tiny graft is held in position for healing.

After the bandages have been applied, they are left undisturbed for about six days, when the eye is thoroughly cleansed, but the success or otherwise of the grafting cannot be ascertained with any certainty until nine days later. Then the stitches are removed. After about three weeks the patient is usually in a state to leave hospital.

With so delicate an operation the proportion of successes is not of course one hundred per cent. This is hardly surprising, not only because of the difficulties involved, but also because of the comparative novelty of the procedure itself. It is true that attempts have been made for very many years to carry out this intervention, but success has been won only within the past decade. Perhaps in some sixty per cent of cases there is distinct improvement of sight, and in twenty-five per cent complete restoration to normal; but

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these figures are steadily being improved upon as skill and knowledge grow. The surgeon's knife has not yet succeeded in completely banishing blindness, if only because some types of blindness are beyond its reach, but at least surgery is achieving a great deal and gradually removing many cases out of the class "hopeless" into which they would earlier have been placed.

Some time later, out of sheer curiosity and interest, I called again at the hospital and asked the surgeon for his history of the case.

He smiled. "I can see you're interested," he observed. "Perhaps the best answer can be given by the patient himself."

I felt that this would be an admirable course. As a surgeon myself, I knew that surgeons' own accounts of their cases are not always strictly accurate!

In one of the general wards I was introduced to a small, quiet-looking man, sitting easily and comfortably in an arm-chair reading a book. This seemed convincing evidence of the success of the operation, though I did not fail to notice that the pages were printed in unusually large type. Another point of interest was that the patient was wearing darkly tinted glasses. Both the large type and the tinted glasses were part of the post-operative treatment, my friend explained.

"It takes about three to four months for patients to regain complete normality of vision," he said. "After that, if the operation has been completely successful, they find they can read ordinary type without difficulty."

"With spectacles?" I asked.

"Not necessarily," he replied; "that depends, of course, on the structure of the eye itself. Quite a few of my patients do not find any need for correction. The chief danger is whether the graft remains completely transparent. That happens in about a quarter of the cases—I don't mean my own only, but taking the published statistics as a whole. In those, of course,

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vision is quite normal. But in thirty per cent or so, though the graft doesn't remain completely transparent, it retains sufficient translucency to enable the patients to go about their ordinary affairs without help. They are definitely not blind or even partially so. Their vision is merely a little dimmed, like an old man's."

I turned to the patient.

"How do you feel about it?" I inquired.

"I think it's just wonderful," he answered with conviction. "I can scarcely believe it's true. A fair miracle it is, and no mistake. I never thought I'd be able to see again, and now here I am reading a book. I wouldn't mind if I didn't get any better than this—I'd still think it marvellous. But the doctor tells me I shall probably be quite normal again in a few months' time. It's wonderful, wonderful!"

Yes, he was right. It is wonderful, for there are few higher tragedies for man and woman than that of sudden blindness.

One of the the great difficulties in operations of this kind, as also in those for nerve grafting mentioned in the previous chapter, is ensuring a supply of material for the grafts. The best results are obtained from corneas taken from recently dead people, and the eyeball must be removed within twelve hours of death. The Americans have tackled this problem in a characteristically energetic fashion by the establishment of a central bureau which they call The Eye Bank for Light Restoration. Here, those who are about to have an eye removed register, so that when the time comes for their operation, use may be made of their corneas, should they be needed. A publicity campaign has also been inaugurated with a view to encourage people to direct in their wills that on their death their corneas shall be placed at the disposal of the bureau. Whether this is the right method of tackling the problem time alone can show, but it does reveal that the importance of the subject has been recognized in at least one country; and that, by itself, is evidence of the high status to which corneal grafting has already attained in its short career.

CHAPTER X

The Knife Among the Glands

Twenty years ago "monkey glands" were news. The press had seized upon the experiments of Dr. Voronoff to rejuvenate human beings by means of gland transplantations and turned them into a sensational story. No doubt it was good copy in the journalistic sense, but it did not a little harm to a branch of medicine that was then beginning to emerge as a vital contribution to our healing resources. As a result of those highly-coloured "monkey gland" stories a prejudice grew up against all kinds of gland treatment—or, rather, to the use of extracts embodying the active principles of the endocrine glands, the substances known as hormones. Today hormones are invaluable tools in the doctor's bag, perhaps the most celebrated of them all being insulin.

It was the thyroid gland that was associated with the notorious Voronoff experiments, and this was one of the earliest of the endocrine or ductless glands to be studied and understood. These glands, as is now well known, are bodies of various sizes—some extremely small, others quite large—which pour special substances direct into the blood stream. They have exercised an irresistible attraction for sensational writers and speakers, because the effects that follow upon their disorder are so striking and utterly disproportionate to their apparent importance in the human system. It has even been claimed that by suitable gland treatment a man's whole personality could be altered; thus

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it is that they have been christened, more romantically than scientifically, "the glands of destiny". And the thyroid is one of the most important of them.

This gland is situated in the throat just below the larynx, and consists of two lobes, one each side of the windpipe, and it weighs about an ounce. But if it appears relatively insignificant, it is very richly supplied with blood, and it also enjoys the distinction of being composed of tissues which are quite distinct from any others found in the body. A lot depends upon its activity. If it manufactures too little of the special thyroid hormone, the sufferer tends to become lethargic and in bad cases may even become mentally deficient, as in the examples of cretins. On the other hand, over-active thyroid has the effect of speeding up the whole of the bodily processes. Typically, the sufferer becomes restless and highly strung, lean and asthenic. But it is when due to intense over-activity the gland becomes grossly enlarged that danger is spelt.

When this happens the condition known as "exophthalmic goitre" or, more technically, thyrotoxicosis, is produced. Probably everyone knows the characteristic appearance of this disease. The neck swells up and becomes grotesquely large and shapeless. The eyes look as though they are starting from the head. With these physical changes go mental ones that are no less distressing. In very extreme cases, split personality may result. Apart from all this there is acceleration in the rate of living already mentioned. The heart beats faster and the respiration increases, since more oxygen is needed to keep the racing system working, just as a motor-car engine calls for more and more fuel as its speed is raised. For the same reason, the body starts to feed upon itself, drawing some of the fuel it needs from the tissues themselves, and the sufferer grows thin and emaciated. The whole picture is, in a bad case, almost frightening.

All this, then, comes from a thyroid gland that is producing too much of its special hormone and sending it into

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the blood stream, causing reactions all over the body. Death may come through what is, in effect, extreme over-excitement of the system, with the heart pounding at much above its ordinary rate and a temperature dangerously high. Quite early in the history of thyroid investigation, operations were tried to cut away either the whole of the gland or part of it to reduce its activity. Limited success was gained, for the operation itself is far from easy and incidental difficulties arise.

The first case of this kind I saw was many years ago, and it was a most distressing one. A sufferer was brought into the hospital obviously *in extremis*. A man of about thirty-five, he showed all the signs of advanced exophthalmic goitre. The neck was so enlarged that it looked like the trunk of a tree. The eyeballs projected so much from the orbits that it seemed a miracle they could be retained in position. His pulse was racing and his breathing extremely rapid. To add to these danger signals, the enlarged gland was pressing upon the windpipe, tending to constrict it, and this, of course, added considerably to the difficulties he was already experiencing in respiration.

Treatment had been given, but in those days little was available to deal with over-active thyroid. Iodine had been administered, but it had not brought much relief, as his present condition showed. There was no alternative but an operation. Though there was nothing new or unfamiliar in the operation, which had been performed many times, surgeons always embarked upon it with reluctance and, in reality, as a last desperate measure.

The great problem is to know how much of the gland is to be taken away to restore it to something like normality. If too little is removed the gland will remain over-active, and many of the ill effects will persist. On the other hand, if too much is taken away, symptoms of hypothyroidism will show themselves, which can be hardly less distressing than those of the opposite state. The only safeguard here is that

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by administering thyroid hormone the hypothyroidism can be corrected, so the practice had been established of removing more than seemed necessary. Indeed, later on, surgeons did not hesitate to excise the whole gland and make good the loss by continuous hormone administration.

In this case, however, for what reason I do not know, the surgeon concerned failed to estimate correctly the amount that should be taken away. It was a fatal mistake in the literal sense. For a little while the patient seemed to be improving, but then the symptoms began to show themselves again. A second operation was attempted, but the man's condition had sunk too low. In a few days he was dead, his body forced to its death by sheer exhaustion through the overworking of every part of the system.

Succeeding years brought greater exactitude in performing the operation, and the improvement in hormone preparations led to greater readiness in taking away the entire gland. During the past two or three years a great change has come over the scene through the alliance of the chemist and the surgeon, which is doing so much to help forward our healing powers.

Only a few months ago, a man in his early thirties came to see me to consult me on this very complaint. His condition was very noticeable, with his enlarged neck and his protruding eyeballs, but it had not gone so far as to be an immediate danger to life. None the less, it was clear that something must be done soon if the worst was to be avoided.

The doctor who had sent this patient, L—— M——, to me had told me that he was a very well-informed man, quite aware of the nature of his condition and its probable consequences, and had warned me that I could speak quite freely to him. M—— revealed this as soon as I had finished my examination.

"No doubt about the diagnosis, doctor," he remarked with an ironic smile. "Simply shouts it from the housetops, doesn't it? I suppose the only thing is an operation. Well,

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let it be so. I don't fancy it, but I suppose it will be all right. To be quite frank, I wouldn't trouble if I hadn't a family dependent on me."

"There's no need to take a gloomy view of it," I replied. "An operation may or may not be necessary, but not at present. We have other remedies now besides the knife, you know. There's a certain substance that you can take for a little while, and that will effect a considerable improvement. In some cases, that treatment is sufficient by itself, but there is always some slight doubt—I am being quite frank—whether the good results will be permanent. The course I advise is that you should take some of this preparation and come back to me regularly for examination. Later on I expect I shall recommend an operation to reduce the gland to normal. The advantage of that method, you see, is that when the time comes for the operation you are in a much better general state, and furthermore the enlargement will have subsided, so that we can do our work under much better conditions."

"You surprise me, doctor," he said, opening his eyes a little wider. They were already starting from his head as a result of his condition. "I had not heard of this method. Of course I shall try it. It sounds good to me—better than I anticipated. If at the end of it you decide that an operation is necessary, I'll submit to it with a much lighter heart than I should now." He chuckled softly. "What surprises me even more," he added, "is to hear a surgeon advising against an operation—or, rather, saying that he'll try other treatment first before deciding whether an operation is necessary."

I smiled in return. "Your ideas of surgery, Mr. M——," I observed, "seem a little old-fashioned, if you don't mind my saying so. Today we don't operate just for the sake of operating. Though I shall always be ready to take away your appendix or deal with your gastric ulcers if you're unlucky enough to need that treatment, it's a ruling principle

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of surgery today that if a structure or an organ can be conserved, it is better so. The human system is a very delicately balanced affair, you know, and one shouldn't interfere with Nature's designs unnecessarily."

"That's most interesting," he said thoughtfully; and then once more he smiled. "But you needn't worry about the appendix. I lost that when I was quite a kid."

The substance which has been introduced in the past two or three years to revolutionize the treatment of exophthalmic goitre is known by the rather involved chemical name of 2-thiouracil. Treatment with this produces quite astonishing results, for the swelling reduces and the eyes lose their protuberance. In some cases this administration seems to be sufficient, but because the drug is so new little is known about whether the results are permanent or not. So today the wisest method is to treat the sufferer with 2-thiouracil, and when his improvement is marked an operation is performed, under the most favourable conditions, to take away part of the over-active gland. This means that the need for excising a large portion of gland is considerably lessened. It is, of course, much easier to perform the operation properly, because the gland has shrunk and has become more normal, so that the amount to be removed can be more exactly gauged.

Mr. M—— came to see me regularly during the course of his treatment, which went smoothly and encouragingly. When that part was concluded, I made another examination and found that though there had been a most marked improvement there were still signs of enlargement, though of course on a much reduced scale. Now when I told him I thought an operation would be advisable, he accepted my opinion almost happily. The effect of the drug had convinced him that medicine was no longer groping in the dark as regards his complaint, and had given him greater confidence.

In the end he was discharged returned to normal, and there is little likelihood of a return of the condition. Furthermore,

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the fact that I had operated on a practically normal neck meant that only a small scar had been left, almost invisible and very different from the often disfiguring scars, almost as unsightly as the original goitres themselves, which the older intervention at a time when the whole neck was distended, all too frequently left behind as evidence.

Progress in our knowledge of the endocrine glands is so rapid that it is sometimes difficult to keep up with it, and new vistas are always being opened. So far as the surgeon's part is concerned, there has been considerable advance in the technique of gland-grafting. Most conditions arising from hormone deficiencies can be corrected by the administration, either by mouth or by injection, of hormonal substances, drawn from natural sources or synthesized by elaborate methods in the laboratory. The drawback of these methods is that, while they give excellent results, the sufferer is always dependent on his medicines, for if he forgets or omits them, all the original symptoms will begin to return. Obviously, if the deficient glands could be replaced by normal and efficient ones, this disadvantage could be overcome, and today much is expected from the encouraging successes which are being obtained in the delicate operations of gland transplantations.

Another field in which there is room for the highest hopes is provided by the artificially radio-active products which atomic research and the erection of atomic piles are making available. Radium and X-rays have been tried for some time for the reduction of excessive thyroid tissue with not very satisfactory results. The grave drawback of radium treatment is that it is difficult to control, and more damage may be done than is necessary. The artificial products, such as radio-sodium, for example, lose all their activity after a known time, so that when their work is done they are absorbed into the system and discharged from it in the usual way. For thyroid, a combination of thiouracil and artificial radio substances may well be the treatment of the future—

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a treatment to which not only the chemist and the surgeon but also the atomic physicist will have contributed. The composition of the team continually extends.

If the thyroid gained notoriety twenty years or so ago and tended to bring the whole science of endocrinology—as the study of the hormones and the glands that secrete them is called—into prominence there is one other discovery in this territory that is even more famous and that has probably brought benefit to more sufferers than any other. That was the final isolation of the substance insulin from the pancreas by Banting and his colleagues in 1922. Its success in the treatment of diabetes, till then a scourge for which little could be done, was instantaneous and spectacular; and those who are, even today, inclined to regard hormone treatment with supercilious suspicion would do well to recall this great triumph. Diabetes is, as most people now know, the inability to absorb essential sugars in the blood, and it is due to a deficiency of insulin—a hormone manufactured in and secreted by the pancreas, or, more exactly, in structures in the pancreas known as the Islands of Langerhans. By replacing the missing hormone through the administration of insulin, the blood can do its work; the sugar is stored in the liver in the normal way, and the whole economy of the body is restored.

Diabetes had long been known. More recently it was discovered, not altogether surprisingly in view of experience with the activity of other endocrine glands, that there were certain people in whom the pancreas was over-active—that is to say, they had too much insulin in their blood, a state that leads to a number of digestive disorders and makes the sufferer crave for sweet drinks. The sugar in the blood goes down and down and convulsions may set in. Death can even occur from this inversion of diabetes.

But death does not come in this way only to those whose pancreas is too enthusiastic. Patients sometimes died without any of the usual attacks of coma and convulsions, and

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these cases remained for some time a complete mystery. Years ago I recall a fatality in the hospital at which I was then working. The patient had been subject to these attacks due to an overactive pancreas; but death came to him during a period of intermission when, apart from disordered digestion, he was comparatively well. The surgeon in charge of the case decided upon a post-mortem, and in the course of this he found attached to the pancreas a tumour of a special kind.

Now, it was already well known that the pancreas was subject to various kinds of tumours, just as other fluid-forming glands are. But this tumour was of a different kind. It contained a substance known as trypsin, which is one of the juices created in the pancreas and plays an important part in the digestion of proteins in our diet. When this fluid was released into the body, either artificially or through the rupture of the tumour, it literally ate up the body tissues with which it came in contact. The same discovery was being made elsewhere, and from it sprang a neat technique of sewing these cysts or tumours so that they formed little isolated pouches. Appositely, the name marsupialization is given to this technique.

Yet another kind of tumour occurs in connexion with an over-active pancreas. These are benign—that is to say, they are just aggregations of tissue too closely compacted together. But in the pancreas they are formed of the cells that produce insulin, and each tumour becomes, in effect, a concentrated source of insulin production. Attempts were made to remove them by surgery, and in the end success was won. This was the surgeon's first real triumph with the pancreas, and his job was made more or less easy for him. These tumours form, in the main, on the tail of the organ, which can be reached without much difficulty. That is not to say that the operation is one of the simplest to perform; it is not, for the pancreas lies in a relatively inaccessible part of the body. And when the tumours were removed, the excess insulin symptoms disappeared, just as had been expected. It was

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this triumph that led surgeons to consider the performance of an operation that had hitherto been considered impossible, yet the need for which was clamant.

Let us look again at this mysterious gland, the pancreas, which plays so remarkable a part in the workings of our system. The pancreas has among its failings a tendency to develop carcinoma, one of the terrible group of diseases generally grouped together under the dreaded name of cancer. Theory suggested that these cancers provided perfect subjects for surgery. They increased slowly and they showed a marked reluctance to invade other tissues of the body. If, therefore, they could be removed early enough, then there was a high probability cure would be complete. Against this had to be set the fact that it was not at all easy to detect the existence of the growths, apart from opening up the body for an exploration. The pancreas lies deep, and its disorders cannot be felt from the surface.

Nature has devised an elaborate code of warnings of what is wrong with the body, and it has taken doctors many hundreds of years to learn her secret code. She had been sending out messages of these cancers of the pancreas for many, many years, but their significance had not been fully appreciated. Now, however, the oracle's message was to be made plain. The body itself could give an indication that cancer of the pancreas existed, though the gland itself was inaccessible to examination.

What happens is simply this: the slowly increasing tumour presses on to the common bile duct, gradually occluding it until at last the essential flow of bile is completely arrested, or almost so. As a result the bile becomes dammed up in the liver, and there results something which has all the appearance of jaundice. But this is jaundice with a difference, for unlike the form that is caused by actual stoppages in the bile ducts the pancreatic form is free of pain. And we know it now to be an almost infallible sign of cancer of the head of the pancreas.

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As I write these words a voice comes to me from the past, over twenty years ago when I was still a student, one of a group going round the wards with a surgeon for whom all of us had the most profound respect, and who, to some of us, had almost the status of an infallible god.

He paused before a bed in which lay a fairly young woman and pointed out the features of her complaint. It was obvious that she had jaundice. Not one of us was in any doubt about that. After we had made our examination he drew us aside and we listened to him with reverent ears.

"You have seen that young woman," he said, "and, rightly, you have diagnosed jaundice. But it is not the normal jaundice. She suffers no particular pain such as arises when there is a stone in the bile duct. The probabilities are that she has cancer of the pancreas, for it is the pressure of the growing tumour that causes this condition. That diagnosis is confirmed by the fact that the gall-bladder has become enlarged and can be felt beneath the margin of the right ribs as a sausage-shaped object." He paused and gave us a keen look. "Yes, gentlemen, those signs are undeniable. They also tell us one other thing: that she is doomed to death."

"Is there nothing at all to be done?" asked one of us.

The great surgeon shook his head. "Nothing can be done to deal with the cancer. It is to all intents and purposes inaccessible, and there is great risk in attempting an intervention. The best we can do is to alleviate the itching the patient will feel and try to prevent untimely haemorrhage. But this operation, which you will see me perform tomorrow, is only a palliative. The cancer will remain untouched to increase and eventually spread to other tissues until at last death supervenes."

This was the first time, I think, we had ever heard our authority confess himself helpless, and it impressed us very deeply. Next day we attended the operation, which was not unspectacular in its way, though it seemed to most of us that it was a highly elaborate procedure for attaining so

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little in the way of results. Briefly, what was then done to alleviate the condition was to make an opening between the gall-bladder and the small intestine, through which the accumulated bile in the liver could escape. The fluid in due course came up against the obstruction in the duct and rebounded so that it reached the gall-bladder, finally escaping through the opening into the small intestine. Ingenious, and demanding not a small degree of skill to ensure that the rather complicated path was followed by the bile; but, as the surgeon had said, it did nothing to stop the progress of the cancer, the seed of death, on the pancreas itself.

Jaundice without pain meant death—twenty years ago, ten years ago. But if the march to victory was slow, it was sure, and within the decade the shock forces of surgery have breached a way into the enemy's defences. It was towards the end of the war, when I was visiting the United States, that I witnessed for the first time an operation for the removal of the entire pancreas. I had read about the triumph of that great American surgeon, Allen O. Whipple, and when I learnt that an operation based on his procedure was to be made in a hospital in the town in which I was staying, I asked for permission to be present—a request that was met with immediate and courteous fulfilment in the traditional American way.

Removal of the pancreas is by no means a simple procedure. That goes without saying, or its achievement would not have been so long delayed. A surgeon faced with its necessity has to take the most elaborate precautions, for the slightest error at any stage may well lead to fatal results. Moreover, apart from the inherent difficulties the operation imposes great strain on the patient, and the most careful pre-operative treatment is demanded.

In that American hospital nothing was left undone. The patient was given—and not for the first time—the most thorough overhaul to determine every minute detail of his

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physical condition. Next came the actual preparation. He was fortified by means of a high protein diet, combined with carbohydrates (sugars) and vitamins. Blood transfusions were made, and injections of the then newly discovered Vitamin K, a substance that controls bleeding, were carried out. By the time the patient was brought to the table, every precaution known to medical science had been taken to guard against mishap.

Anaesthesia was given by continuous spinal injection, a method that ensures that the patient can be kept continuously in exactly the desired state without undue danger, and the incision made. Now comes the time when the surgeon has a great responsibility placed upon his shoulders. He has approached the pancreas with considerable difficulty, but he cannot decide whether all the elaborate means so far adopted are justified—that is, whether the operation is worth while—until he is actually able to feel the tumour. At that operation I watched fascinated while the surgeon carefully explored the tumour itself and went on to palpate the surrounding tissues. If the adjoining lymph cells have already become involved, the chances of success are small. Nor does the exploration cease with this. The liver itself is examined with the greatest thoroughness, and if lumps are found it is a danger signal—almost a fatal danger signal; for they indicate that metastasis, the circulation of cancer cells through the blood, has begun, and that the disease is no longer confined to the pancreas. If that is so, the operation is usually abandoned.

But in this case the adjoining structures were not affected, and the surgeon proceeded to the major task. First the common bile duct was removed and means were provided for diverting the flow of bile to the small intestine. Sometimes the gall-bladder itself must be removed when greater difficulties are created for the surgeon, for he has to connect the bile duct direct with the bowel. Then the stomach is divided and the upper part connected to the small intestine below the

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site of the tumour, an operation known as anastomosis and familiar to every abdominal specialist today. Finally, the pancreas, the duodenum and the bile duct are freed so that they can be cut away. This is a difficult matter. These structures lie close to the largest blood vessels in the body, the aorta and the vena cava, and if either of these is perforated death would almost certainly result. Every small point of bleeding has to be closed. The whole operation calls for the greatest skill and patience, for it may take hours to perform it satisfactorily.

Not always is the whole of the pancreas removed. Today an attempt is usually made to save a small part at least of the gland, if that can be done with safety, for if the entire organ is removed the patient becomes severely diabetic and has to be given constant insulin treatment. Even the preservation of a small fragment will prevent the occurrence of this distressing condition. Techniques vary, but the result is the same in ensuring that some small part of insulin-forming gland is left to maintain the balance of the body's secretions.

Since that memorable occasion, I have myself performed the operation, but it is not one I approach at all lightly. It is, indeed, one of the most serious in the whole range of surgical practice today. Yet, despite its seriousness, it is one of the major triumphs of these past few years. Here the surgeon's knife has scored a sensational victory over cancer in one of the most inaccessible parts of the human system, and has brought the chance—a high chance—of life to many who, only a short time ago, would have been condemned to death sooner or later.

Patience, skill, determination—these are the qualities that won the fight against cancer of the pancreas; and the same qualities are winning victories which, if less spectacular, are none the less important on the whole of the surgical front.

CHAPTER XI

Conquest of Cancer?

We have been talking about cancer of the pancreas, and it is as well that we should go on to discuss cancer in other parts of the body. Indeed, there is nothing that needs greater ventilation than this subject. Today, cancer is popularly regarded as the most dreaded disease of all, and people whose bodies are so healthy that they rarely require a doctor's care go about in deadly fear of it. It is not too much to say that in most minds the word "cancer" has become almost a synonym for "death", with the implied suggestion that the death is lingering and painful. Too much has been said about cancer—and too little.

The "too much" concerns the scourge of cancer, the debit side of the ledger. The "too little" applies to the credit side—the victories over it that are being claimed daily in our hospitals, and the hospitals of the whole world. Statistics are freely used to indicate how fell the disease is, for it almost tops the list of the most prolific causes of death. But, as has so often been remarked, there is truth, there are lies, and there are statistics; and statistics prove as much or as little as you want them to. True, many people die of cancer every year; but that is rather an indication of the fact that modern conditions predispose to the formation of cancer in the human body. The official figures do not reveal how many people have been treated successfully for cancer during the year for every one of those that died. What the doctor knows is that there are several diseases far more deadly than cancer

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—diseases for which there is even today no real cure, and in some cases barely a palliative. But because they are rare they figure low in the list of mortality rates prepared by the Registrar-General and his counterparts in America, France, Australia, and elsewhere.

One extraordinary thing about the general attitude to cancer is that an air of hopelessness is prevalent. It is assumed that because the actual cause of cancer (there are probably several) is not definitely known, all treatment must be little more than a shot in the dark with appropriately hit-and-miss results. This curious belief exists in relation to no other disease. If medical science waited till it knew completely the origins and causes of each specific condition, it would not get very far; it would in fact have remained stagnant for thousands of years. Pasteur, with his discovery of micro-organisms as disease-causing agents, knocked the bottom out of all hitherto accepted theories of disease-causation; but that did not mean that all doctors were fools and charlatans before Pasteur, any more than all surgeons were mere butchers and sadists before the advent of Lister and his antiseptic methods. As a matter of cold fact, there are very few diseases of which we can say with perfect certainty that this or that factor is the cause. None the less, we have today cures for very many of them. There are many processes in the human body itself about which deep ignorance exists; yet when those processes go wrong the doctor very frequently has an effective means of setting them to rights again.

If we do not know what causes cancer—that is to say, if we cannot pin it down to the operation of this or that micro-organism—we do know quite a lot of what the disease itself is and how it attacks its victim. Because of that knowledge we can, in the majority of cases, take adequate defensive and offensive measures against it. Too much emphasis has been placed on this aspect of cause, for ignorance of causes does not mean practical impotence. A child can repair a toy by knocking in a loose nail with a hammer, and the job he does

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is quite as good as if it had been done by a professor who knew that the nail was held in position by the friction exerted by the expanding wood fibres round the iron shank of the nail. One can drive a car without being an expert in thermodynamics; one can even repair it without being a metallurgist, a combustion chemist, or an expert in the differential calculus.

What, then, *is* cancer?

There is nothing at all mysterious about it. Cancer is simply the state that develops when a group of body cells refuses to obey the normal laws of growth and development and, in effect, goes into rebellion against all the ordered and delicately balanced constitution of the human system. These cells are like a rogue elephant; they have cut adrift from the herd and devote the rest of their lives to destruction. They multiply too rapidly, and then, having aggregated in one place to upset the local economy, they seek fresh *lebensraum*, in the manner of lawless aggressors, and begin invading neighbouring territory, where they stir up further revolution. If unchecked, they reduce everything to chaos.

First, the invading cells take over the adjoining tissues, forming a lump or tumour, which continues to grow. Next, they find their way into the lymphatic system, which acts as a guard against the spread of infection through the body. All about this system are points called nodes, which trap any invaders. The cancer cells get caught there, too, but they do not submit to extermination. On the contrary, they take over the defence post and form a new colony—a secondary cancer. Finally they set out along the blood stream. They invade the small blood vessels and, by the process known as metastasis, find the way to various parts of the body, where they begin their deadly work anew. Modern research has even discovered the most likely places for these invaders to settle. Cells that begin as bone cancers migrate chiefly to the lungs; those that have their origin in the prostate gland have a preference for bones, more particularly the spine.

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Even people who have some understanding of these facts refuse to admit that cure is possible. They argue thus: Cure may be possible in the very early stages and when the disease is localized, but once it has begun to spread, what is the good of cutting out or destroying the original colony? Cancer will only spring up again in another place.

This looks logical enough, but it is not strictly true. Perhaps twenty years ago there was some justification for the view, but it certainly cannot be conscientiously maintained today. Experience has shown that with modern techniques, removal of the original source does slow down cancerous activity elsewhere, even where cases are far advanced. Some remarkable procedures have been developed for dealing with such cases.

Here is one striking and fairly recent discovery that shows, in itself, how much can be done by the modern surgeon using all available knowledge in his fight against cancer. The prostate gland is an important one in the body, particularly in men, and it is intimately connected with the sexual system. Unfortunately, apart from other weaknesses, it is prone to cancer. Experiment showed that there was a distinct connexion between sex hormones and the progress of the cancer. Acting on this hint surgeons removed the male sex organs, with the most remarkable results. Not only was there a marked improvement in the condition of the prostate itself, but even when the disease had spread by metastasis to the bones there was a reduction in this as well. In this case, it will be noted, no direct attack was made on the original site. Admittedly, this method does not induce a cure, but it effects much; and once the first assault has been successfully made, subsequent attacks may win the final victory.

There is no need here to go into the whole subject of the growth of cancer. This is not a textbook, even in a popular way, and my aim is rather to compare what happened twenty years ago with what can be achieved now. In so far as cancer is concerned, has there been any real progress?

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To that question only one answer is possible on the facts. Today we can say with conviction that cancer can be cured, if not in all cases then in a high proportion of them. But even more so than in other diseases, the need for early recognition and treatment is paramount. Provided the surgeon can get to work early enough, the fear of cancer is largely illusory and should be no greater (and no less) than that of any other disease. Unfortunately, many people neglect to take their problems to the doctor until they are so far advanced that the work of cure is made immeasurably more difficult if not actually impossible.

I have said that cancer can be cured in very many cases if the surgeon is allowed to get to work early enough. That was deliberate, for surgery remains the only really effective way of dealing with cancer. Nothing could in fact be more logical. Rebellions must be ruthlessly rooted out. If they are merely scotched they will spring up again. So the surgeon's knife, which excises the whole of the revolutionary colony, is the complete answer—and the only one. X-rays and radium can be useful in some cases, but more often than not as ancillaries to surgery. It may be that the use of the artificial radio-active elements will alter the position, but so far that is little more than guesswork.

One of the most common seats of cancer in women is the breast. It is so common, in fact, that every woman who discovers any sort of lump in one of her breasts, no matter how small and insignificant it may seem, should immediately seek medical examination and advice. Indeed, in practice the rule is to assume that any lump in a woman's breast is a cancer until it is proved otherwise. But this is mentioned for a purpose, not to cause alarm and despondency. What it is desired to stress is the importance of early diagnosis.

If cancer of the breast is taken early, when the growth is confined entirely to the actual cells of the gland, then the proportion of cures may be as high as eighty per cent. But once the disease has invaded the neighbouring lymphatic

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tissue, then the recovery rate drops steeply to below forty-five per cent. Nothing could be more convincing of the value of early diagnosis and cure. Incidentally, the figures show that even in bad cases the recovery rate is much higher than many suppose, for forty-five per cent is no basis for the general air of gloom and hopelessness.

Refinement of technique has done much to lower the mortality rate from operations for cancer, but it is in early diagnosis that the greatest progress has been made. Just because the surgeon now has at his disposal greater resources for recognizing cancer in its earliest stages, so the proportion of successes he wins mounts steadily.

One of the most difficult forms of cancer to recognize until it has gone to an advanced stage is that of the stomach. The signs and symptoms can easily be confused with those of other abdominal conditions, and, at best, rarely are more definite than to create a suspicion. In my early career, the diagnosis of stomach cancer was a tricky business, and often the finest specialists were deceived until it was, to all intents and purposes, too late.

Today we make use of an ingenious instrument known as a gastroscope. This consists of a straight metal tube which has attached to it a flexible rubber section, the whole being so designed that it can be introduced into the stomach without causing the patient undue discomfort. The flexible rubber part is provided with a series of scientifically arranged lenses, by the aid of which the surgeon is enabled to see for himself what is going on in almost any part of the abdominal cavity. He can either confirm or reject the suspicions that other indications have provided.

This is a remarkable step forward, for it does help in the earliest possible recognition of cancer of the stomach, and this is of very special importance, for the operation it entails is of considerable gravity. A considerable portion of the stomach itself and its associated lymph nodes has to be cut away, and the remaining part joined to the small intestine.

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Here again the surgeon has been helped by the inventiveness of the instrument designer. A special double tube is used following the operation to keep the stomach empty while at the same time passing liquid food into the intestine below. Now that the gastroscope makes early recognition so much more certain, the rate of recovery in these cases has risen sharply and may reach as high a figure as sixty per cent.

Those miraculous gifts to medicine, penicillin and the sulpha drugs in special forms, are playing a large part in aiding the surgeon in his war on cancer, particularly when the colon is involved. This part of the intestinal tract is normally seething with bacteria and micro-organisms of many kinds, all of which are likely to cause fatal infection. It was for this reason that in the recent past operations on the colon were regarded as risky in the extreme. But the new powders make it possible for even this infested region to be reduced to a condition of almost complete sterility. So it has come about that the mortality rate of an operation, against which as a young student of surgery I had been repeatedly warned, has dropped to a level that is little, if any, higher than that for appendicitis—surely a remarkable advance.

Because cancer attacks almost all parts of the body, success in surgical treatment is dependent on the progress made in the general surgery of the region concerned. Basically, the surgeon's attack is the same wherever the cancer may occur—to cut out the tumour and the associated tissue and make good whatever damage that excision causes. Obviously he is helpless if surgical technique does not provide him with a method of reaching the site of the disease. Already in this book we have seen that in the past two decades almost every part of the body has been made accessible to the scalpel. Cancer of the lungs, not so long ago regarded as incurable, can today be treated—and successfully—because means have been developed of operating on the open chest without danger to the patient. Though these methods are so recent, already the records show that cures can be effected in at least fifty

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per cent of cases—once again, if the diagnosis is made early enough. In the last chapter we saw how an even less accessible region has been conquered—the pancreas. So the march goes on.

It is as wrong to underestimate the danger of cancer as to overrate it. These few notes have shown that there is no cause at all for the fatalistic attitude of despair which so many adopt towards the disease. The surgeon would be the last to claim that he can guarantee cure in all cases; equally he resents the constant implication that when he gains an undoubted success it is due to the operation of some mysterious process that he does not understand, or even to luck alone. Modern surgical science has powerful weapons, and the fight against cancer can be carried to a final and successful termination if he is given the opportunity of using them in the most favourable conditions.

That is the crux of the matter—that the public must co-operate more closely with the doctor if cancer is to be finally brought into subjugation. At the moment, it sometimes seems to the surgeon that patients are in opposition to him, for their fear of being told they have cancer keeps them away from the doctor until it is all but too late. If the figures for recovery in cancer cases seem low, then perhaps it is not entirely due to the lack of skill and knowledge on the part of the surgeon. It may equally well be ascribed to the fact that he is so often called in only at the last moment when even hope is useless.

To sum up, the only effective treatment for cancer is surgery; and surgery has a fine record of achievement fully to justify its claim that cancer will yield to the knife. But cancer is an insidious enemy and, like all such enemies, must be promptly dealt with. To enable him to nip it in the bud, the surgeon has perfected, with his allies, many new and certain methods of detecting the fifth column within the body even when it is still working, so to speak, underground. The cancer victim need not ever feel that his case is hopeless from

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the start. On the other hand, he must be prepared to give all the aid he can to the surgeon by submitting himself to examination at the slightest suspicion.

Meanwhile research goes on ceaselessly in every country in the world where facilities exist. Strand by strand the tangled knot of the cancer problem is being unravelled. Each year adds a little to our already not inconsiderable knowledge. It may be that in the future the use of artificially radioactive substances may supplant the surgeon's knife—that is possible but not probable. Fundamental discoveries may even indicate how cancer can be avoided by suitable prophylactic measures. But there is no need to wait for these or other imaginable advances. The means to deal with cancer are in our hands if we have the wit and common sense to use them properly and effectively. The surgeon waits with his instruments and his skill. It is for the public to see that he gets the chance to use them to the full—and surely that is not too much to ask when it is the public themselves who will benefit by it.

CHAPTER XII

Vitamins Help the Surgeon

Among the many medical curiosities that have caught the public fancy that of haemophilia is one of the best known, probably because it has affected several members of the royal families of Europe, particularly the tragic last Tsarevitch. The unhappy sufferer's blood has not the power to clot, so that if he cuts himself the haemorrhage will not stop and he is in danger of bleeding to death even from a minor injury. Probably most people know this, and also that the condition is hereditary with the peculiarity of being transmitted by the female though only appearing in any marked form in the male. It is this hereditary factor, perhaps, which makes people discuss it with such freedom; they argue, no doubt, that they can't possibly suffer from it themselves because there's no record of it in the family!

Apart from the fact that, as every geneticist will agree, there is always the chance of its appearing spontaneously, due to what he would call "a mutation of the genes", or units of heredity, there is a very similar state to which any one of us might fall victim no matter how clear our family tree might be of the seeds of haemophilia. It occurs sometimes as a complication of jaundice—and that disease is something from which no one can consider himself immune. A patient in this state is very much like a haemophiliac. If he scratches himself there is a flow of blood suggesting a major injury, while any more serious wound is likely to endanger life itself. No, it is not too wise to dismiss as the prerogative of kings the likelihood of having blood that will not clot!

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I was brought into contact with this medical fact in a concrete form quite early in my career—while I was still a student, in fact. A professor was giving a short disquisition on a case of jaundice which we had just seen with him.

The patient, a man in middle age, was in a serious state. I will say something more of jaundice and what it is later, but here I will content myself with stating that the common bile duct was completely blocked. He was a horrible saffron colour, his eyeballs were the characteristic yellow, and he looked very near to death's door—as, indeed, he was.

After the professor had run over briefly the causes of this condition, he said that the obvious remedy was to operate to remove the obstruction. But that, he added, was impossible.

"This morning," he said, "the nurse came to me and said the patient had accidentally cut himself on the rim of a glass. She was in some alarm because she had the greatest difficulty in controlling the haemorrhage, and she wanted to know if he might be haemophilic. I examined him and decided it was one of the late complications of jaundice. That makes an operation impossible. I needn't tell you, gentlemen, that one thinks not twice but three times, and very seriously at that, before one operates on a patient whose blood has lost its power to clot.

"The difficulty is," he went on, "that this is a bad case. The loss of clotting power is almost complete. In a less serious one, I might have given him injections of calcium to help the blood to clot and take the chance. But even then it's a risky procedure. It's not easy to estimate the degree of clotting power of the blood, nor to determine how the patient will react to the calcium. So my advice to you, gentlemen, is never operate on a patient in this condition unless you are absolutely driven to it—and then, if it can't be avoided, don't do anything unless you've made the most searching preliminary tests and feel reasonably sure that calcium will keep the haemorrhage within controllable bounds."

Despite appeals that were made to him both by the patient

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and by his relatives, the professor refused to operate, and in the upshot the patient died. It was a sad case and another instance of a state of affairs not at all uncommon twenty years or so ago. The theoretical treatment was clearly seen; in such and such circumstances one should operate. But the means of performing the operation safely and without unjustifiable risk were not available. So the surgeon had to stand by helplessly and watch his patient die, knowing that the only practical alternative was to see the victim die on the table or shortly afterwards.

It took a long time and an immense amount of research to overcome this particular difficulty that stood in the way of successful surgical interventions on the liver and its associated organs, and to understand the story one has to know a little about the way in which these parts of the human system work and how they go wrong.

The liver, of course, is a part of the human system about which almost everyone considers himself an expert. It is the organ that is a perennial source of trouble by protesting far too much after a party, and by causing, so it is said, strange coloured spots to float before the eyes. It is also an organ that insists upon constant dosage with various kinds of much advertised salts and pills. Probably, like most other parts of the system, it would work much better if it were to be deprived of these attentions. But that is beside our present point, which is to explain something of the liver's function.

It is quite true that the liver is one of the most important members of the team that make the body work. If anything happens to it there is an immediate reaction throughout the entire system. That is because the liver performs quite a number of indispensable functions, some of which have, indeed, only been discovered comparatively recently by medical research workers, despite the fact that people have discussed their livers since time immemorial.

The liver is at once a gateway and a barrier. It acts as a filter between the gastro-intestinal tract, on the one hand—

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that part of the system in which food is absorbed after digestion so that we may live—and, on the other, the bloodstream, which carries the nourishment to all parts of the body. The veins from the upper part of the tract combine to form a single large vessel, known as the portal vein, which enters the liver. Here it joins the digested food material, and, as a result, some most important events occur.

In the liver itself are a large number of units known as lobules, each one of which, in turn, is composed of a series of cells. The food-laden blood from the portal vein enters at one corner of the lobule, washing through all the cells, and finally being picked up and carried away by another vein leading out from the centre of the lobule. But before it goes on its way, a train of vital reactions has occurred.

First of all, a great deal of the sugar content of the blood has been extracted and stored in the liver cells, which return it, as it is required, to the bloodstream, so that the level can be maintained at a pretty constant concentration. The sugar is stored in the form of glycogen, the formation of which is dependent on a supply of insulin from the pancreas—a fact already familiar to us.

Glycogen storage is one of the most important functions of the liver—but it is only one. The liver, as has been said, is a filter. It tries to eliminate all dangerous and poisonous substances in the blood, though not always with complete success. If these pass back into the general circulation they may reach the brain and cause various disorders. Incidentally, this is a function of particular interest to surgeons, for chloroform is one of the substances that are too strong for the liver to eliminate, and its use as an anaesthetic sometimes causes quite extensive liver damage. Today, therefore, chloroform is practically a thing of the past so far as anaesthesia is concerned, apart from the fact that better anaesthetics are available.

Another duty of the liver is seeing that the protein foods, of which meat and milk are two examples, do not harm the

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body by poisoning it. This may seem strange in connexion with such important items of diet, but the fact is that during digestion these foods are formed into amino-acids, as the chemist calls them, which contain nitrogen. The liver deaminizes the acids, thus protecting the system from poisoning, forms urea from it, and dispatches this to the kidneys to be voided in due course. Urea, incidentally, was the first organic substance to be synthesized in the laboratory outside an animal body. If urea gets into the blood, danger is signalled.

In addition to all this, which might be considered quite enough for one organ to perform, the liver manufactures body protein. Roughly one can say that the steak we eat is converted from ox muscle into human muscle in the liver. These busy cells are several chemical factories in one. Nor do the activities stop there. Apart from dealing with already digested products, the liver itself takes part in the digestive process by forming bile; and it is the behaviour of this bile that is probably the most widely recognized function of the organ. Between the cells are fine bile capillaries which link up the several lobules in the whole liver and finally pass it through two vessels, one on either side, into the common bile duct, which discharges into the small intestine. Whenever we eat a meal there is a demand for liver bile to complete digestion, so reserves have to be built up to meet the sudden and heavy calls. The bile, therefore, is stored in the gall-bladder, which empties itself as required and under the stimulus of food, particularly fats, into the common bile duct.

The gall-bladder itself is a prolific cause of trouble to the human being. For a reason that no one so far has completely elucidated—there are competing theories—stones are apt to form in the bladder—the familiar gall-stones. If there is only a single stone, even though it be comparatively large, it may not cause more trouble than an occasional colic pain, which shows itself particularly after the consumption of fatty or greasy foods. Actually a large stone is less dangerous than a

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collection of small ones, for some of the latter may be carried along with the bile into the duct that leads out of the bladder. When this happens, intense pains occur, curiously enough most noticed beneath the right shoulder blade.

Troubles have a habit of growing rapidly once they have begun, and the next possible stages arising from gall-stones have in them the roots of serious disorder. If the sufferer is lucky, the stone may be washed out at last into the common bile duct and into the intestine, where it causes no further discomfort. But equally it may lodge in the common bile duct. Now the case is serious indeed. The gall-bladder may become distended with accumulated bile, and if it is not treated it may rupture. From that in turn may come peritonitis or abscesses. True, peritonitis is not the serious problem it used to be, but no one wants it if it can be avoided. Nor does the surgeon particularly want a case on his hands, despite modern methods. Death can result if the obstruction is not removed and the bladder removed or drained in time.

Here again there has been a marked change in treatment in the past few years. Not so very long ago, gallstones causing obstruction were not regarded as cases for emergency operations. Today they are put in the same class as appendicitis and perforated ulcers—as a condition that must be relieved with the utmost speed; and, as a result, many lives are being saved annually.

But the kind of stoppage just mentioned—blocking of the small duct—is not the most serious condition. If the common bile duct becomes completely occluded, the victim is already on the road to death—though recent developments provide the means whereby he may be saved from completing the journey.

There is, as we have seen, a constant flow of bile along the common bile duct. Despite the blockage it continues to flow—and accumulate against the block. In time, back pressure develops. Slowly the flow of the stream is reversed until at

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last the bile is forced back into the liver lobules and so into the blood stream. This is jaundice. The disease is, in fact, bile in the blood, a fact that accounts for the discoloured skin and eyeballs. The sufferer finds himself subjected to a continuous itching, which becomes at times unbearable. He scratches himself, the nails tear the flesh—and then he discovers, like that patient of my student days, that his blood no longer clots.

So we have come back to the patient on whom my old professor could not operate. But though we now know the sequence of events that led up to his condition and the appearance of bile in his blood, we do not know why the power to clot has been lost. Nor did the professor when he spoke to us of calcium. In fact it was not until a very few years ago that the reason for this state was understood at all.

Curiously enough we have now come up against the subject of vitamins, which seem unlikely in this connexion. Vitamins, as the food advertisements so often remind us, are substances which, present in minute quantities in the food we eat, are essential for the preservation of health. Their importance is so great and their absence from many manufactured food products so noticeable that sometimes it is necessary to take them in tablet or liquid form. Since they were first discovered and named “accessory food factors”, many new ones have been discovered, while those that had been known before—notably Vitamin B—have been split up into a number of related types.

The vitamin with which the liver is concerned is known as Vitamin K. It is one of the most recently found members of the rapidly growing vitamin family, but it is also one of the most important. Vitamin K controls yet another activity of the busy normal liver, for its presence enables the organ to manufacture what is known as protothrombin; but it cannot do so unless there is also bile in the intestine. Protothrombin, as its name implies, is the material out of which thrombin is manufactured by the body. This is the crux of the whole

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matter, for thrombin is the constituent of blood that enables it to clot.

The sequence of events in the jaundice victim is, therefore, that because of the blockage and the consequent escape backwards of bile into the blood, the intestine is robbed of its bile. But in the absence of this bile the liver cannot produce protothrombin. For so long as this state of affairs lasts, the sufferer becomes a haemophiliac. He might die from a small cut.

Now the reason why the professor would not operate is clear. His patient would probably have bled to death on the table, for though it is obvious that relief of the obstruction would enable the liver to return to its task of manufacturing protothrombin and so providing the blood with thrombin, that result could not be attained without submitting the patient to haemorrhage that would almost certainly prove fatal. Calcium was of some use, as we students had been told, but it was not highly successful. Later, blood transfusions were used. The transfused blood had its own protothrombin. But the method, while it was an advance, was not altogether successful, besides being somewhat involved and tiresome.

Vitamin K itself provided the way out this impasse—or, rather, a synthetic form of the substance prepared by the chemists in their laboratories. For those who are interested in such things, the chemical name for it is 2-methyl-1, naphthoquinone. The procedure is quite simple and rational. If this substance is injected into the body, it finds its way to the liver, which then converts it into protothrombin. Now the blood clots and the barrier to surgery is removed. Patient research has provided the surgeon with the means of dealing with those cases of common bile duct blockage on which in bygone years he feared to operate, knowing that his remedy was likely to prove even more disastrous than the condition it sought to cure.

What, then, does the surgeon do today when he is faced with such a case as that before which my professor, great

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man though he was, had to confess his impotence? Let me, as the most practical way of explaining, take a leaf from my own casebook of a few months ago.

So far as physical condition went, my patient was in an almost identical state with the one I had seen in the hospital so many years before, and have seen repeated so many times since. It was, in fact, a typical case of complete stoppage of the common bile duct. The smallest scratch induced profuse bleeding. This was a case, in fact, that would have been inoperable a few years ago, yet there was now no need for dismay or regret. One could proceed along the lines of an already established routine.

First of all came the thorough examination, which includes an estimation of the blood proteins, to determine how well the patient will withstand shock, and a number of other tests to establish the general condition. But the most vital determination of all is that which reveals how far the liver is able to operate normally. This had proved a difficult matter to begin with. Even after Vitamin K injections had been introduced, patients still died unaccountably until it was discovered that the liver itself had been reduced to such a state that even when normal conditions were restored it could not take up its proper work. So one starts today by injecting the synthetic vitamin K substance, or giving it in heavy doses through the mouth, and then taking blood samples to find out how much prothrombin is present. This gives an index of the degree of activity of the liver.

Luckily, my patient gave a good reaction to this test, as well as to the others, and the stage was now set for the operation itself. Even if his reactions had not been so favourable, however, his case would still not have been hopeless, for it would have been possible to build him up on a special diet, glucose injections, and blood transfusions.

Operating on the bile duct calls for the greatest possible care, for the slightest damage to the liver itself may have disastrous results. The common bile duct is easy to locate,

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for it is usually distended and very noticeable. Once it has been brought out, it is opened and the obstruction, which is usually a gall-stone, is removed and the duct itself cleaned. The duct is closed with a special T-tube in position. This gives a free passage for bile to pass to the intestine, and also provides a means whereby the excess bile that has been accumulating can be drained off safely. The drainage may take weeks, but not until it is finally completed is the wound closed. Before this final stage, an opaque chemical is injected up the tube and an X-ray photograph is taken to ensure that everything is now as it should be.

My own case was a straightforward one as these things go, and there were no complications. There had been no damage to the common bile duct, and the patient made rapid progress to recovery—a very different state of affairs from the unfortunate patient who had been, perforce, allowed to die by the professor. Damage to the duct is a complication that every surgeon performing this operation fears. Sometimes it is necessary to cut out the injured part and reconnect the severed ends. To prevent the formation of constrictions, a tube of a special inert metal, vitallium, is inserted to stimulate the formation of fibrous tissue which provides the missing link between the gall-bladder and duct.

In more extreme cases, where even this is impossible, surgeons nowadays can perform an operation that seems almost impossible. A rubber tube is put into the liver ducts and brought out to the surface through the incision. As time goes on, a tube grows from the liver to the skin, discharging bile all the time. This is known as an external biliary fistula. When the time comes, the fistula is carefully dissected from the abdominal wall. Now comes the most delicate part of all. Dexterously the surgeon turns the tube inwards and attaches that end of it which was previously on the surface so that it joins the intestine and replaces the original duct which had to be cut away.

Obviously, this is an operation which only a few gifted

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specialists can perform, but it is, to my mind, one of the most extraordinary tributes to the skill of the contemporary surgeon. It is indeed a far cry from this elaborate procedure to the state of affairs when fear of haemorrhage practically denied sufferers the surgical help that might have cured them. Yet this great stride forward has been taken in a very few years—that number, in fact, which has sufficed to bring me from early manhood to what is generally known as the prime of life.

CHAPTER XIII

An Insidious Enemy

There is a word that has occurred a good many times in the previous chapters—a word that is much more important than it looks. It is the little word “shock”. To the surgeon that word has a very special, and at times, ominous, significance. What does he mean by “shock”?

That is a question to which, surprising though it may seem, there was no real answer until quite recently. But before we look into this very important subject let us ask what the ordinary man in the street means by it. He says he may be shocked by some case of brutality—but then he is speaking of being morally outraged. A child springing upon him suddenly from a doorway gives him a shock. He may get a shock from carelessly handling live electric wires. He uses the word, in fact, in a dozen different contexts and always with a vague connotation. Very rarely could he define exactly what he meant by it. Certainly he does not think of a shock as a killer, as a desperate danger against which constant precautions must be taken if life is not to be endangered. Or perhaps nowadays he may be inclined to allow that there can be such a meaning. During the war thousands of ordinary citizens came face to face with daily death and suffering; many of them mastered the rudiments of first aid so that they could serve as wardens or ambulance drivers or rescue men; and they knew that one of the first things to do to a casualty was to “treat for shock”—which meant keeping the person warm with blankets and giving

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him hot, sweet tea. They learnt, too, of men and women who had died from shock in first-aid posts and E.M.S. hospitals or even before they could reach either. But this was a new and special use of the word, and it is doubtful whether our ordinary man thinks of it when he talks of the shocks he encounters in his day-to-day existence.

Once I was appointed assistant to a very well-known surgeon, with whom it was an honour to work. Perhaps it was the sixth or seventh case I had had with him—at any rate it was quite early in our association—but it is one I recall very clearly. It was an amputation case. In an industrial accident, a man's arm had been terribly crushed and lacerated, and unfortunately he had lain for some time before he was discovered. Yet the operation was performed successfully, and I had duly admired the skill of the surgeon with whom I was working. I was even feeling gratified that I had the honour of helping him to save yet another life. But my laudatory thoughts were premature. The casualty died suddenly. There was no infection of the wound, no obvious physical cause. He had simply gone into a very low state and his life had just drained away.

"Shock," said the great surgeon tersely. "I saw a good many men die like that in the war." He was referring, of course, to the First World War, in which he had served with the army medical service.

Shock was a term that had been in medical use before the First World War, but never with any precise significance, and it was only that holocaust which brought it into scientific prominence. The story of the early investigations into the problem, fascinating chapter though they form of surgical history, cannot find a place here, where I am merely trying to point out the changes that I myself have witnessed in my career. This only need be said: that nothing seemed to avail against this mysterious cause of death. Sometimes warmth helped, but the only thing of which those heroic surgeons could be sure was that life seemed to ebb and ebb until a

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certain point was reached. When that had been attained, no human aid could arrest further change into death.

Yet this new conception of shock was one of the turning points of surgery, and the surgeon today owes much of the success he gains to the fact that the First World War aroused interest in a baffling problem. If he operates today with confidence, and takes a low mortality rate as normal in his work, a lot of it is due to the thorough-going investigations that have been made into the subject of shock. One of them, incidentally, is a by-product of this research. Quite early in the studies it was noticed that shock was more likely to occur in injuries that involved extensive crushing. It seemed then—though the theory had afterwards to be abandoned—that one of the factors concerned was muscle damage. From that time surgeons have been careful to organize their procedures so as to cause as little damage to muscle fibre as possible, with a great gain to their patients. The past twenty years have seen a great advance in the delicacy with which all types of operations are performed; the surgeon has come to realize that no damage, however slight it may appear, is unimportant to the human system.

One of the earliest observations of cases of shock revealed that when it occurred the blood grew thick and dark, as though some significant change had taken place in it. While some research workers were striving to discover the cause of shock and producing a multiplicity of theories, each one of which had subsequently to be abandoned in turn, others concentrated their attention on discovering what exactly had happened to this blood; and from the work of the latter followed practically all the modern successful treatment of shock cases.

Why was the blood thick and clotted? The answer to that was simple. Blood is composed of two main constituents: the cells, which are living entities, and the plasma, which is the fluid in which they move and live. The cells themselves are of two types: the red cells, which carry the vital oxygen

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round the body, and the white cells, or leucocytes, which act as defenders of the body against infection and multiply whenever there is a threat, just as soldiers might be rushed as reinforcements to a spot the enemy was attacking. A blood count which reveals how these white cells have concentrated is an important indication of a number of diseases, an indication on which modern diagnosticians place great reliance.

The fluid part of the blood is the plasma, and it is this which disappears when the blood has assumed the typical dark, clotted condition seen in shock. In effect the blood is concentrated, so that the cell part, which normally constitutes about one half of the total volume, becomes more closely aggregated, to form almost a sludge.

As research went on, more and more striking facts about blood were discovered. The fluid part was found to be complex. The strictly fluid part consisted of a saline solution in which a number of different salts were found; in addition to this there are more complicated substances, proteins of the albumen and globulin groups. Such large molecules make what is known as a colloid structure, and it is noteworthy that at the time they were being discovered in the blood plasma, colloid chemistry was making rapid progress.

When the blood was centrifuged off—that is to say separated into its fluid and solid parts by whirling it round rapidly—the solid part that remains is found to be almost precisely similar to the heavy clotted blood seen in shock victims. The only difference was that while shock blood is low in oxygen content, this centrifuged blood had the normal proportion. This was a lead that research workers quickly took up.

In the end, it was put forward that the protein molecules in the blood had a decisive effect on its volume. If the proteins were absent the blood could take less water into it, and the surplus escaped into the tissue. Indeed, it was established that if the protein content was allowed to become extremely

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low, the escape of water was so large that ankles swelled and in time the rest of the body also, just as in dropsy.

A vital discovery had been made and proved. True, it did not say why shock occurred, but it did give surgeons a knowledge of the sequence of events; and it indicated a method of treatment. As has been pointed out before, medical science cannot wait until causes are established. Its aim is to make use to the full of existing knowledge even though no perfectly logical and complete system lies behind it. Little by little the picture grew clearer.

It seemed that when excessive injuries occurred the capillaries grew, as it were, coarser in texture, so that they could no longer hold back the large protein molecules from escaping into the body away from the blood stream. The water, too, found its way out, as the protein deficiency grew. In the end the blood thickened owing to the denser concentration of the cells.

At last the mechanics, if not the cause, of shock were being worked out. The rapid pulse, one of the signs of shock, was due to the difficulty the heart was experiencing in driving the thickened blood round the circulatory system. The pressure fell because of the reduced volume due to the escape of the plasma. In turn these effects acted on the brain, which strove to restore some sort of equilibrium by restricting the space of the blood vessels. The blood is turned back from the extremities to keep alive the brain and the essential deep organs. Hence it is that the hands and feet become extremely cold. In the end, if the condition goes untreated, the attempts fail, the oxygen content of the blood becomes insufficient, and death results.

The remedy lay in blood transfusions applied at an early stage. This sounded simple, but the problem still remained of discovering when the state of shock existed, since it was no use to leave matters until the more obvious signs of danger revealed themselves. Laboratories were able to make such tests, but the methods were too elaborate and slow. The

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patient could not be left while they were made, for each passing minute might be for him one step nearer to the grave. The answer was found in the "drop test", in which a drop of blood is allowed to descend in a suitable liquid. From the time it takes to descend, its specific gravity can be immediately determined and signs of increase over the normal immediately discovered. This is the method employed today. It is simple, safe, and sure; and just as soon as the drop test discloses the onset of protein loss, then the transfusions begin.

So far remarkable progress had been made, but the practical details of treatment had still to be worked out. Transfusion in those days meant finding a donor immediately available of the correct blood group and transfusing immediately from him to the patient. Even when this was done a difficulty remained. For when whole blood is transfused, while it is true that the missing plasma is restored and the protein loss made good, considerable quantities of cells also are put into the blood system. The result is a tendency for the concentration of cells to increase still more, not at all what was desired, for under these conditions the essential restoration of proteins in sufficient strength was not attained.

There was an almost obvious solution of this problem. It was not to transfuse whole blood but to use plasma only. From that discovery sprang many important developments that stand at the basis of modern surgery. The blood is centrifuged into its solid and fluid fractions. The brown plasma fluid is then siphoned off into a suitable flask, a small amount of antiseptic is added to preserve it, and what results can be tightly stoppered and kept for when it is needed. No longer was it necessary to have at hand a blood donor of the right group. Plasma does not have to be matched. Indeed, under the modern system of collecting blood from a great many donors the plasma from all of them is mixed together so as to provide a more or less averaged, standard solution.

At last surgeons had an efficient treatment for shock, but some practical difficulties remained. There was the matter

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of storage. Plasma could be kept, it is true, but for not very long periods—two years at the most in exceptional cases. Moreover, the fluid did not withstand very high temperatures or very low ones; it throve only in a temperate climate. What surgeons needed was something about which they did not have to worry. It might have to be used in a hurry, and it caused some anxiety in an emergency never to be quite sure that the plasma being administered was in perfect condition.

The next stage in this amazing story of the blood was the preparation of sera from the plasma. The method is similar to that employed for the production of other sera—that is to say, the fluid fraction is evaporated off leaving behind a powder containing the essential solids—in the case of blood plasma the vital proteins. Today, therefore, when the surgeon wishes to give plasma, he takes an ampoule of the powder, adds distilled water, and he has the perfect plasma.

It has already been pointed out that the proteins in blood belong either to the albumens or the globulins. Further research showed that the globulin was relatively unimportant, and that it was the albumen which had the property of maintaining the conditions under which the fluid was retained in the circulation. It was only a step further, then, for the chemists to separate the proteins and to pack into the ampoules only the necessary albumens. This made for still greater compactness and ease of handling.

It is not to be imagined, from what has been said about shock, that the modern surgeon does not make any further use of whole blood transfusions. Plasma is employed for shock, but there are many instances in which it is inappropriate. If a man has lost blood through heavy haemorrhage, it is clear that this can only be replaced by fresh blood. In certain surgical operations, the introduction of whole blood plays an important part, as we saw when we discussed operations on the liver. Modern surgery, in fact, makes ever-increasing demands for blood for transfusions which alone may be the means of preserving life. Those many people who

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come forward regularly to give their blood for the National Blood Donor Service are doing a service which is of the highest value. As is now well known, the blood is stored under low temperature conditions, which preserve it in all its freshness for a considerable time, but there is always a certain amount of wastage through deterioration, and that is why appeals are constantly being made for more and more blood donors.

It has taken more than thirty years for a successful method of treatment for shock to be evolved, and even today, after all the work that has been done, we are still in no way certain how shock itself is caused. That the cause will be discovered one day can hardly be doubted, and then perhaps measures will be devised to prevent its occurrence rather than to arrest it when it has begun. The point is, from the practical point of view of the surgeon, relatively unimportant. The scientist in him would like to know the why and wherefore, but in his daily work he is more than satisfied with the knowledge that he has at hand a means of dealing with emergencies as they arise; and the simpler and more effective those measures are, the better he likes them.

Yes, the cure for shock exists. It is no longer the mysterious bogey stalking round the casualty wards and the operating theatre waiting for its moment to strike. But because that is so, research has not ended. The chemists work on, and already their line of action is marked. Once a natural substance has been isolated from a human or animal body the chemist is never satisfied until he has synthesized it in the laboratory and produced it artificially or discovered some other substance that produces the same results. Work on the synthesis of the blood albumens is being undertaken intensively, and it may be that in due course the plasma used will be made in the laboratory instead of being derived from human blood itself, just as, for example, synthetic vitamins are today widely employed in place of the naturally occurring substances. Side by side with this, experiments

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are being conducted with chemicals that may have the same effect on blood in restoring the missing proteins to it. Science never stands still; the medical and chemical branches are no exception to the rule. The perfect blood substitute may yet be found and the day of the donor be past.

These are matters which lie somewhat outside the sphere of the surgeon himself. It does not matter vitally to him whether the product he uses is a natural or synthetic one, provided it gives the results he needs. All he demands is that the preparations shall be effective and easily obtainable and usable.

In the First World War deaths through shock formed a high proportion of the total fatal casualties. Even some time afterwards, as the case I quoted at the beginning of this chapter showed, death from shock was taken as something against which the surgeon had no remedy and with which he had no need to reproach himself. Yet in the Second World War deaths from shock were comparatively rare, even in the most remote theatres of operations. The ampoules of plasma could be taken anywhere without inconvenience.

I well remember how, during the height of the various air attacks on this country, when I was working as a surgeon for the Emergency Medical Service, the presence of those stocks of blood plasma was a constant reassurance—as also were the vials of whole blood which were available if the need arose. Air-raid casualties were often injured in a way that tended to produce shock. Many of the injuries were due to crushing, and often the unhappy victim had been trapped in such a way that it took literally hours for the rescue squads to extricate him. During all that time, his arm or leg was pinned down by fallen masonry or a heavy beam of wood. That the lives of these people were saved was almost invariably due entirely to the fact that shock had been conquered. The conquest of shock is indeed one of the most important advances ever made to the general corpus of surgical knowledge and practice.

CHAPTER XIV

Casualties

Casualties is a word that suggests war. But peace has its casualties no less than war, and in these days they are on an extensive scale. Even in these austerity post-war days, when motoring is restricted by petrol rationing and when new cars are difficult to obtain, so that the total amount of traffic on the roads is not so high as before the war, it is considered a good month in which fewer than four hundred people are killed upon the highways. Air travel is safe and sure, but, none the less, crashes occur, and sometimes as many as forty, now that large transports are employed, may perish in a single accident. Industry claims its victims day by day, for despite all the elaborate safety regulations that law enjoins, operatives still succeed in crushing, lacerating, and mutilating themselves in moving machinery. Builders and painters fall from heights; old people—and young ones—trip over mats and pitch down a flight of stairs. No one who knows anything of the work of the casualty wards in our hospitals would uphold the view that the word “casualty” is something that belongs predominantly and overwhelmingly to the field of battle or the air-raid.

Nor can it be said that civilian casualties—the tragedies of peace—are any the less distressing than wartime ones. Often they are more serious, and it is an odd reflection that, though hospitals are available and doctors’ surgeries are at hand, many of these civilian injured take longer to find

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their way to adequate treatment than the men stricken on the field of war. But that is by the way.

There is, however, one strong link between the casualties of peace and war. Experience in the wars of the past thirty years has done a great deal to enlarge our knowledge of traumatic injuries, as they are called, and their proper treatment. Fractures, dislocations, crushed limbs—all of these can be treated not only more satisfactorily, but also more safely than they could be twenty years ago or even less. The civilian surgeon on casualty work may not have quite so many enemies to fight; in particular he is not so much concerned with gas gangrene, which killed so many in the First World War and even claimed many victims in the Second—though that does not mean that he has not constantly to be on his guard against infection. Nevertheless, many of the cases brought to him are extremely distressing.

I have previously mentioned a case of industrial injury with which I was concerned, albeit in a minor capacity, in my early days. Another one, from a slightly earlier period, shows what was being done to severe injuries in the closing years of the 1920's. The victim was an Italian who had in some way managed to become involved with the machine he had been attending in one of the local factories. He was almost unconscious from shock and loss of blood when he was brought to hospital—not in an ambulance but in an aged Ford car whose bumping and rolling cannot have done much to improve the patient's condition.

My work lay in the casualty department at that time, and I received the man, though any operation would, of course, have been performed by one of the senior surgeons of the establishment. It is curious how some things remain in the memory, though they are now of no particular importance. I have only to close my eyes to see all the details in my own handwriting that I had set down on the record card of this case—details given to me by a voluble brother who accompanied the casualty, and who explained frenziedly to

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me that he had to threaten the factory owner with a knife before that gentleman would permit his Ford to be borrowed to serve as an ambulance.

The victim's name was Enrico M——. He was forty years of age, married, and had five children. He was a porter and had no right to be anywhere near the machines at all, but then, said the brother, it was always Enrico's way to put his nose into what didn't concern him. It was all irrelevant, but I had to note most of it down. Family histories were regarded as extremely important.

I was far more interested in assisting the senior surgeon to make his examination. The left arm was fractured in several places, and the whole limb was very badly lacerated. There were signs of crushing, too, and in places the muscle fascia had been reduced to a mere amorphous pulp. I looked at the surgeon questioningly, though I knew what his answer would be. We had not a few casualties like this at the hospital, some better, some worse, but all fairly serious.

"Amputation, of course," said the surgeon in reply to my unspoken question. "There's nothing else to be done. No good trying to set that arm with all those other injuries. Infection would set in at once and then we'd have to amputate in any case."

I nodded. It was just as I had expected. I was young and perhaps sentimental, and I thought of the wife and the five children of this breadwinner whose market value on the employment ring was now to be heavily reduced. It was unlikely, even if the surgeon, who was a man I did not admire in any way, left a stump that could be used for an artificial arm, that Enrico M—— would be able to afford such a device. A wooden arm with a hook, perhaps, but no more; and a wooden arm is little, if anything, better than no arm at all.

The event showed that I need not have worried. The surgeon went to work with ruthless efficiency and the arm was removed. He used the old-fashioned—it was that even at that time—guillotine operation, which means in effect

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that the whole limb is sawn through in one piece and left at that. Perhaps the surgeon had decided that Enrico would never have an artificial arm so there was no need to go to any particular trouble with the case.

"He'll be all right," said the surgeon, as we were washing together. "The best thing in all such cases is to make an amputation. The chances of success with anything else are too remote to consider, unless the injury's very slight. If you don't amputate at once, it usually means that the case will come back, from infection in all likelihood, and then you'll have to do the work all over again. Remember that."

I have remembered it. I remembered it when, with the bombs falling all round us, my colleagues and I at the E.M.S. hospital never so much as considered an amputation on any one of these air-raid casualties unless no other course was open—and even then we did all we could to ensure that there was a usable motor stump, properly tapered to a conical shape, to make the fitting of an artificial limb as simple and successful as possible. I remember it when patients come to me with badly injured arms or legs, or I see them at the hospital, and they say to me pathetically: "I suppose I shall have to lose it, doctor. I don't know how I shall manage. I'm certain to lose my job. You see, I'm a toolmaker . . ." Or perhaps he is a watchmaker or a labourer. He is nearly always a worker whose skill lies in his hands, a fact that enhances the tragedy.

If it was twenty years ago, I should have had to nod slowly and agree. Perhaps I would have added something about having an artificial arm. I would have seen that last faint light of hope die in his eyes as he shook his head. The steel hand of the modern artificial arm is a very wonderful thing—but it is no substitute for the trained, skilful fingers of the craftsman.

Yes, I should probably have been forced to take that line twenty years ago with these casualties. But now it is a different story. When they say they suppose the limb must go, I smile encouragingly and shake my head.

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"No," I say, "I think I can save it. Anyway, we can try, can't we? You'd prefer it, I know."

It is a great change, yet why should it be so? These injuries are usually fractures. They may be accompanied by lacerations or crushings. None of these conditions is today beyond hope. Broken bones—even pulverized bones—can be set or replaced at a pinch. Torn muscles, and even nerves, as I have told in a previous chapter, can be grafted. The replacement of badly damaged skin is a simple matter.

Of course, many of the techniques for achieving all these results are new, comparative freshmen in the school of surgery, though all have been proved in the most testing trial of all—military surgery. But let us for the sake of argument suppose that all this was technically possible at the time of that accident case in the hospital in Italy. Would the surgeon then have tried to save that woefully damaged arm? Frankly, I do not think so. He was a clever and experienced man, whatever my personal opinion of him may have been, and he rather liked displaying his skill before an audience of students and newly qualified doctors aspiring to become surgeons. What he feared was infection. It was a threat and a problem to which, then, there was no answer.

If there is one man to whom victims of accidents such as those I have mentioned and the surgeons who treat them owe an irredeemable debt, it is J. Trueta, the Spanish surgeon who came to world-wide fame during the Spanish Civil War, when, as one of the medical officers with the Republican Armies, he revolutionized the treatment of war wounds, and also of industrial and similar accidents. Trueta is one of those men whose names stand out among the topmost of surgical fame.

Until he developed his method of treatment of injuries there was no control for infection—no effective control—which might set in during the healing. That was why competent surgeons preferred to amputate rather than conserve. A man who lived with only one sound limb instead of two was better than one who died from gangrene. The

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risk of infection is, of course, greater in war injuries than in civil ones, but even in the latter it used to be fairly high. It was another of those bogeys that haunted the surgeon, setting all his skill at naught and claiming for death those whom he had thought he had saved.

Before Trueta showed the way, there had been all kinds of attempts to overcome this danger of infection. As early as the end of the First World War an American surgeon had startled his colleagues by covering wounds at once with a plaster of Paris dressing and leaving it untouched for days on end—a method that was the direct antithesis of the conventional method of daily dressings and sterilizings. He had gained some success, even sending a batch of casualties home to America and leaving the dressings in position during the whole of the transatlantic voyage. Yet, though he had sensed something of the truth that Trueta was later to unfold, his method was not entirely successful, and conservative medical opinion did not hesitate to make the most of his failures. Sometimes, when the dressings were opened, the wound was found filled with pus. Moreover, the weight of the cast not infrequently induced further injuries when the bones had multiple fractures.

Trueta laid down several simple fundamental principles that form the basis of all modern treatment. The wound must be dealt with as soon as possible, not later than five hours after infliction, for after that period any untreated injury is likely to become infected. The surgery must be deep and thorough. Not only must all foreign bodies be removed, but all pockets that might harbour germs must be exposed. Then, and not till then, is the plaster dressing put on the injury and left there for several days, or even longer. The results were astonishing. Out of five thousand cases treated in this way, some of them serious examples of compound fractures, there were only thirty-seven deaths, a mortality rate that works out at less than one per cent; a truly remarkable figure that appears miraculous when set against former records.

The Trueta method had, as a matter of fact, been introduced

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before the Spanish Civil War, for he had used it in dealing with industrial injuries in Catalonia, but his published results were questioned. It needed the stern demonstration of war to prove that his revolutionary theories were based on fact.

When the Second World War broke out, the Trueta method was adopted from the start. But wider and more searching experience enabled improvements to be made. British military surgeons made considerable contributions to the newer science of treating traumatic injuries, which include both war wounds and civilian accidents. An active agent in forming infection was found to be a bacillus of the anaerobic type, which means one that dies on exposure to air. So the newer technique was to deal drastically with the injury, opening it up so that the air could penetrate deeply into the tissues and bring death to the lurking germs. After such exposure the wound was closed. Moreover, new infection-destroying agents became available—first the sulphonamide drugs, and then penicillin. When these have been applied the plaster of Paris can be left in position for long periods, permitting the natural restorative processes of the body to have full rein. Further progress was the closing of the wounds with sutures, hitherto considered undesirable.

This does not imply that all danger of gas gangrene, as real in civilian accidents as in war, has been eliminated. It is far less likely. But cases still occur, and the remedy for them is still being anxiously sought. Sera are administered and blood transfusions are made to provide the victim's own circulation with copious forces of white corpuscles to fight infection and of the antibodies which play so important a part in preventing invasion of the tissues by disease organisms.

So much for wounds, though much more could be written on the subject. The general principles today are to leave the wound open for a short time after it has been thoroughly treated surgically, to remove all damaged tissue and foci of infection. Then the wound is closed, just as an operation incision is, with sutures. This last step has two important

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results. In the first place, it speeds up healing; the second, a most important one from the patient's point of view, it leads to a great reduction of scar tissue as compared with former methods. A bad injury today does not mean that one need be hideously scarred for life. That is, of course, true in any event, for the plastic surgeon can deal with any really unsightly visible scars that form.

But what of fractures, surely the most common of civilian injuries? Here again the resources of surgery have been widely expanded. Badly broken bones, fractured in many places, can be put together with the aid of plates and screws made of either tantalum or vitalium, metals which have no reaction on the body and do not give any trouble once they are in position. Using bone fragments, the plastic surgeon can even replace bones that have been crushed out of existence. The art of mending man has indeed made progress. And behind all this are the growing skills of the physiotherapists, who teach damaged limbs to work again and restore normality of function.

In the past, metal plates and nails had been used to repair broken bones, but the results were far from satisfactory, for the metals employed set up electrical action when they came in contact with the body fluids. Vitalium was the first metal to show that it was inert in this respect, but tantalum was even better. Moreover, tantalum can be put in place of missing bones, since it is easily moulded and is strong enough in this state for the purpose. It promises, indeed, to create a minor revolution in plastic and restorative surgery.

So for the cases that come to the casualty wards today there is something more than the hope that they may be patched up and sent back into the world living human beings if not perfect ones. They need not fear that the severely injured arm or leg must inevitably be lost, nor need they stand in dread of the danger of mortification. Once more the modern spirit of surgery to conserve at all costs is revealed, and the power of the surgeon's knife to effect this desirable end is demonstrated.

CHAPTER XV

Sex and the Scalpel

Up to now we have been discussing and comparing surgical practice as it is today and its counterpart of some twenty years ago as a sort of index to show how much progress has been made, but it has been done almost entirely from the doctor's point of view—or, more precisely, from the standpoint of my own personal experience during that period. But it is not only surgery that has altered. There has, too, been a marked change in the attitude of the public, which has in many ways made the work of the surgeon easier, because he now feels that most of his patients regard him as a helpful friend rather than a potential enemy whose one aim is to mutilate their bodies.

This change of view is more noted in some fields than in others. In cancer, for example, the confidence of the average man in surgical treatment increases but slowly, despite the fact that greater readiness on the part of sufferers would, as we have seen, greatly increase the chances of success. Elsewhere the surgeon's advice is often sought on subjects that twenty years ago were barely mentioned to a doctor of any kind. Nowhere is this new trend more remarkable than in the sphere of sex, which is now widely recognized as a human function in no way fundamentally different from any other activity of the human body—and therefore lying within the province of medical science. No doubt sex education has played a great role in effecting this new attitude, which most enlightened people will agree is all to the good.

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Sexual disorders and maladjustments are capable of causing intense unhappiness, and the old idea that they should not be discussed or brought out into the open, even in the privacy of the doctor's consulting-room, only succeeded in making the misery of these sufferers greater. Twenty years ago the whole subject of sex was still intimately bound up with moral taboos and beliefs, though there had, of course, been a considerable retreat from the strict Victorian attitude. If some of those taboos still linger, they are not nearly so strong, and it has not been shown that the newer, more common-sense view has been productive of any deterioration of moral standards. It is in fact very difficult, from the scientific point of view, to see why a person who, for example, suffers from some sexual abnormality which can be relieved by medical science should not take advantage of his opportunities for correction, just as he would resort to medical treatment for any other failing in his constitution. Yet there remain some people who condemn equally the resort to treatment and the abnormality itself, thus making the unhappy victim a moral outcast whatever he does.

When I was a young surgeon, the moral entanglements of sex problems still affected some of the older doctors, who would sometimes refuse so much as to discuss these matters with their patients. One case in particular I recall; it has remained in my memory as an example of the older non-scientific approach which once dominated medical practice.

It was the case of a young girl in her teens whose puberty had been marked by the most distressing changes. A normal child till then, she had, soon after her periods had commenced, started to develop distinctly masculine tendencies. Hair was showing on her face, and her figure suggested far more the boy than the girl. Her parents grew alarmed and brought her for consultation to a doctor at the hospital where I was then working. He had some vague idea of the case with which he was to be confronted and he asked me

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to be present at the consultation—not, I think, that he placed any particular reliance on my inexperienced opinions, but to give him moral courage in what he felt was going to be an awkward situation.

It was the first case I had seen in the flesh of what is known as adrenal virilism. This is due to over-activity of a part of the adrenal glands, and when this occurs in girls or women it sometimes has the unhappy result of turning them, so far as outward appearance is concerned, into men. More will be said of this later in this chapter. The adrenals were among the very first of the endocrine glands to be investigated, and quite a lot was known about them then, though not so much, of course, as there is now. Operations on these glands had been performed, and they were less difficult than the thyroid to deal with surgically at that period.

The doctor listened carefully to what the girl and her mother had to say, but he did so in a very detached manner, as though the details had no real significance to him. At the end the mother implored him to help her save her child from what she not unjustifiably considered a terrible misfortune. He pursed his lips and hesitated a little before he replied.

“Madam,” he said at last in a slow, cold voice, “I do not doubt that your daughter’s condition is very distressing to you and to her also. Her abnormality is plain, and I will confess to you that medical science has an explanation for it. The reason is that a certain gland in the body is over-developed and over-active. Some surgeons might be prepared to operate in order to alleviate the condition. I myself cannot undertake to do so. Man must not be presumptuous and seek unduly to interfere with the designs of Providence. A doctor’s duty, madam, is to relieve bodily suffering, cure disease, and so on. I do not consider that an operation is necessary to save your daughter’s life or to relieve her of any physical suffering. I am sorry if I seem hard, but matters like this do not lie within my province.”

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The poor woman looked as though she had been struck in the face. I imagine that she had never expected to hear such cruel words from the lips of a doctor. He confessed that the power to return this girl to normal was in his hands, but he refused to use it. She left the room with bowed head, a picture of puzzled defeat. For myself, I could say nothing. It would have been improper for me to comment on the opinion of another doctor, especially one who was much my senior in the hospital. But I need hardly say that the incident impressed me deeply as an example of the unwisdom of mixing moral considerations with medical science. Naturally, a doctor, like any other man, must act according to his conscience, and if he is asked to follow a course of conduct which violates his principles he has every right to refuse. Nevertheless he could, as I think he should, give a fair statement of them and recommend his patient to seek other advice if she wished.

Such cases of disorder produced by irregularities in the working of the adrenal gland are, if not frequent, at any rate not extremely rare. The adrenals came early into prominence, and, indeed, it was the discovery of their action that formed the foundation of the whole study of the endocrine glands. They were found to be responsible for the condition known as Addison's disease, which may briefly be described as a steadily deepening lethargy ending in final death. It is due to the gradual destruction of the adrenal glands. Research brought to light that the glands manufactured a substance—a hormone—known as adrenalin, which, besides being important in the activity of the human system, has also found a place in medical practice as a valuable stimulant for the heart.

As their name implies, the adrenal glands lie close to the kidneys. There are two of them, and together they weigh no more than one-third of an ounce—about as much as a penny piece. An under-active adrenal may lead not only to Addison's disease but also to lack of growth and the

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breakdown of the heat-regulating mechanism of the body. Deficiency can be remedied today by the administration of the hormone cortin which is also secreted by the gland, and very successful results have been attained.

Cases such as that of the young girl, leading to sex inversion, at any rate so far as the external characteristics are concerned, are due to over-activity of the gland. Almost invariably such over-activity is reflected in curious sexual anomalies, which may even occur in children at birth. For such cases, which affect men as well as women, surgical intervention is the only course, and often it meets with surprisingly successful results.

As a contrast to the case which I have just quoted, I may refer to one which was sent to me for advice not so very long ago. In this case, the patient was a man, T—L—, in his late thirties. I could see as soon as he was shown into the room that he was in a state of considerable anxiety. Though the day was warm and the season late spring, he was wrapped in a heavy raglan overcoat, which gave him a curiously shapeless appearance.

He wrung my hand in silence, and I did not press him at once with questions. It was obvious that he was in difficulty as to how to approach the subject, and in such circumstances interrogation often increases the embarrassment.

At last he looked up at me with the merest ghost of a smile.

"I hardly know how to begin," he said slowly. "It's very difficult for me, doctor. I—well, it's something I don't like to talk about."

"There aren't any subjects you can't talk about to a doctor," I replied. "I don't know you, Mr. L—, though I hope we shall establish friendly relations. For the moment, just think of yourself as a case for my attention—don't bring anything personal into it at all."

He shot me a grateful glance. "You are very helpful," he resumed. "The fact is—well, I seem to be changing my sex."

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"I see," I said calmly. "Well, the medical textbooks record a good many cases of that kind, so you need not think there is anything new and astonishing about it. Tell me all about it."

"That does surprise me," he muttered. "I thought it was most unusual. But if you say it isn't, then of course that makes it easier."

"When did it start?" I asked.

He shook his head. "I hardly know how long it's been going on. The changes have been gradual. In fact, it was my wife who drew my attention to one or two things in the first place."

"Ah! So you're married? Let's begin at the beginning and let me have full details about yourself."

He was thirty-nine, married, and the father of three children, the eldest of whom, a boy, was now fifteen. By profession he was engaged in business with South America. All his life he had led an active, athletic existence. He had played rugby for his school and for one of the better-known clubs. Swimming was one of his favourite pastimes. He was the sort of man, as appeared very early in the interview, who took a pride, though not an inordinate one, in his masculinity.

"And now," he said gloomily, "I'm turning into a woman. It's horrible, and I can't understand it. My whole shape's changing. That's why I wear this overcoat—I'm ashamed to be seen."

"Take it off and let me look at you," I ordered.

He did so, with evident reluctance. A man who, as I guessed, had been aggressive and assertive all his life had become excessively shy and sensitive—a change in itself enough to produce profound distress in him. And he had cause for his shyness. When, at my instructions, he had stripped, I could see what he meant by his phrase that he was "turning into a woman". The bodily contour had acquired a distinctly feminine characteristic; the distribution of the

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hair on the body was changing; and there were even signs of enlargement of the breasts. The picture contrasted oddly with the muscular development, which suggested a broad-shouldered, hour-glass-shaped athlete. The more I saw of him, the more I understood his acute anxiety.

"It's so damned awkward," he protested. "I daren't go swimming now for fear people will notice things about me, and my eldest boy is beginning to give me curious glances. I feel I just want to go away and shut myself up where I can't be seen. Tell me, doctor, is it possible for anything to be done, or must I go on like this getting worse and worse?"

As he spoke, he revealed another sign of his condition: his voice acquired a feminine intonation and rose sharply.

"Until I've carried out a very thorough examination of you, I can't say anything definite," I replied cautiously. "But I will say this: cases such as yours are known and some can be treated, so you need not abandon hope. It may involve an operation, but I presume you would not object to that."

"You can do what you like, doctor," he returned desperately, "so long as you put me right—or even if there's only a faint chance of making me a man again."

I submitted him to a very thorough examination, as the result of which evidence of an over-active adrenal was clearly shown. I suspected it was due to a small tumour, as it often is, and it was this circumstance that led me in the end to suggest an operation. He agreed at once.

"But don't run away with the idea that your cure is already as good as complete," I warned him seriously. "If it's a tumour, then there's a very good chance, but until I have actually made an incision I cannot know definitely. If the gland is affected, then it will be much more difficult. There would still be a hope, though very much less than if it's a tumour."

"Any hope is better than none," he commented.

As it turned out, my hopes—for that was what they were—

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that it was a tumour were correct. It was a very small one, but it was causing the gland to pour too much of the hormones into the system and so produce signs of femininity. It was a simple surgical procedure to remove it, and when he was able to discuss the case again with me, I was able to give him an encouraging prognosis. He smiled happily, and thanked me. I am glad to say that the simple operation was successful, and when he called to see me somewhat later he could report that some at least of the female characteristics were decreasing, and he was looking forward to the future with renewed hope.

This was a fortunate case, because no more than a small tumour was involved; but sometimes adrenal over-activity is caused by enlargement of the gland itself, and then the case is very different. There is no particular surgical difficulty about excising a portion of the gland to reduce it to a normal state, but the problem is to know how much of it to take away. There is more danger here even than with the thyroid. If too much is removed, then the symptoms of Addison's disease may develop, due to under-activity of the glands; but it is not quite the same as the form of the disease occurring normally, and experience shows that it more often than not has a fatal termination. There is hope, however, that new forms of hormone treatment may put in the hands of doctors an effective remedy. In the meantime, the surgeon's knife provides, for both men and women, some chance of release from the anxieties and distress that follow on these spontaneous changes from one sex to another.

Not always in these cases are the adrenals involved. Disorders of other glands may produce curious sexual disorders, some even more marked than the one I have quoted. Among the most striking—though this condition is also due to adrenal over-activity in the part of the gland known as the cortex—is that of pseudo-hermaphroditism. Externally the child cursed with this appears to be male, but internally there is a complete set of female sex glands

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and organs. Truly the sex is female, though the indications are all male. Such states are often only discovered by accident—as, for example, when an internal operation has to be performed, say for appendicitis. When they are recognized, they can sometimes be remedied by an operation on the adrenals.

But perhaps the most striking case of all I have had to handle in the way of sexual anomalies concerned a girl in her early twenties whom I will call Irene. She came to me in a state of great distress for which there was no obvious explanation. Like T—— L—— she was reluctant to speak; but unlike him she did not respond to silent sympathy and encouragement.

“But why have you come here?” I asked. “Are you ill? If so, what is the matter? Have you pains anywhere?”

“No, no,” she replied, shaking her head vigorously. “I am perfectly all right, I’m not ill at all. There’s nothing the matter with me in that way.”

I was inclined to agree with her. So far from looking an invalid she had all the hallmarks of perfect health—and very attractive health at that, for at twenty-three Irene was one of the most attractive petite brunettes I had seen for a long time. Her features had the quality of beauty, and there was nothing to suggest why, when she relaxed, she was betrayed into a haunted expression such as I have seen often in the eyes of men and women who, racked with suffering, long for nothing but death.

“Tell me,” I said softly. “What’s the matter?”

“Life’s hell,” she snapped suddenly. “I want to die. I can’t go on as I am. It’s disgusting. Either I’ve got to change my sex or I will kill myself.”

I glanced at her in some surprise. This was surely an extraordinary request to bring to a surgeon, especially as there seemed so little justification for it. I could not imagine why on earth so obviously attractive a young girl should hanker after being a man. I told her so quite bluntly.

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"I can't talk about it," she said, dropping her head. "You'd better examine me and see for yourself."

No sooner had I begun the examination than I saw the reason for her acute distress. It was one of the most extraordinary cases I had ever seen. Her body was covered with hair. Now it is well known that the distribution of hair on the male body is different from that on the female. The man is much more hirsute, and the hair tends to spread over the chest and the abdomen. If one covered up Irene's face and looked at her body, one might have imagined that she was a young man with a rather feminine figure. Cover the body and look at her face and the reverse effect was obtained: one was aware only of a beautiful girl in the hey-day of her youth.

Clearly this was no case of adrenal virilism, for, had it been, there would almost surely have been signs of hair on the face, and there were none. Thoughtfully I told her to dress and then I began to question her closely about her intimate life.

It was a tragic story. She had been forced to shut herself off from all the life that she had wanted to enjoy. She shunned male company, and she did not dare to bathe or undress before other women. One by one her desires and ambitions had had to be abandoned. Now she had come to the stage when she felt she had nothing else to do but choose between a change of sex, since she was firmly determined that she must be a male, or death. As to her sex life, it did not exist. She had no urge towards men nor had she any homosexual tendencies.

"Why is it you did not seek treatment before?" I asked.

"I did," she replied bitterly. "It was no good. They sent me to a psychoanalyst. I wasted weeks and weeks with him, and even if he'd been doing any good to me I should have had to pack it up—it was getting too expensive. But he wasn't helping at all. If I'd been abnormal in my desires, well, I suppose he could have helped me. But I'm not. He didn't seem able even to understand that I wasn't. I've come

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to you as a last resort—I admit it. I don't suppose you can do a thing, and I quite expect you to say so. I'd rather you did, in fact. I'd hate to undergo treatment only to find in the end it was no good. You see, if you turn me down I shall know where I stand and what I've got to do."

I caught the meaning of those last words. She was in a very desperate state and something had to be done quickly if she was to be saved from tragic disaster.

During the examination I had noticed that one of her ovaries, the fundamental female sex gland, was grossly enlarged to about three times its normal size. That puzzled me. An enlarged ovary should hardly produce male characteristics. But it might be evidence of some internal malformation which led to the production of both male and female sex hormones. If that was so there was a chance, but it was a slender one. I told her frankly the state of affairs.

"I am ready to operate if you agree," I said. "I confess that it's not much more than an intelligent guess, and I can give no guarantees; but at least that enlarged ovary ought to be dealt with."

"How high would you put the chances?" she asked doubtfully.

"I can hardly say. In fact, I won't go further than saying I think an operation holds the only chance, however slender, for you."

After some more questions, she agreed to the operation. Her reluctance was due to her loss of confidence in medical science, engendered by her experience with the psychiatrist. This does sometimes happen. In their own field, psychiatry and psychoanalysis have performed many wonderful things, but they cannot deal with purely physical abnormalities. Yet there is a belief that any sex problem lies in their province. Irene was so clearly the victim of some physical disorder that it is difficult to imagine how the idea of psychological treatment ever came to be entertained. If, as she had said, she had been given to abnormal sexual practices, then

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probably psychiatric methods could have helped her. She was not. The one over-riding sign was her physical appearance in her body—and it is a mystery how psychoanalysis could be expected to charm away that superfluous hair.

The operation was simplicity itself. After the abdomen had been opened, I found a large tumour on the right ovary. This was what I expected might occur, but I was anxious to discover the true state of affairs. Accordingly I enucleated the growth with the greatest care, making sure that it was not damaged, and when it had been removed I retained it for expert laboratory examination.

She had not left the nursing home after the operation when I was able to bring to her the report of the examination. The reading of it had caused me the greatest excitement, for it had confirmed my wildest guesses. It had been found that the tumour was no ordinary one, but was composed of tissues precisely similar to those of the male sex glands. In effect, what this unhappy girl had been carrying about with her was an undescended testis, which poured male hormones into the blood and so led to the development of male characteristics.

"And now," I said, "I think your troubles are going to mend. With that out of the way, your own glands will be able to reassert themselves and you will develop into what Nature obviously intended you to be—a very attractive and charming young woman."

She smiled and acknowledged the compliment, but I could see she was still doubtful. For so long she had believed herself incurable that it had become almost impossible for her to imagine a return to normality.

The weeks went by and slowly the expected changes began to occur. Step by step the hair disappeared from her chest and took on the more normal feminine distribution; and finally there was nothing about her, physically, to suggest that she had ever been anything but a normal, healthy girl. It was not so with her mind. Her retirement from the world,

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her distress and anxiety, her belief that she was in some way neither man nor woman, had made it difficult for her to accept the established fact of normality, and she had once again—and with much persuasion—to visit a medical psychologist, who, somewhat painfully, undertook the task of re-educating her to take a natural place in life. His work was successful. When I saw her only a short time ago, she had already lost her self-consciousness and was beginning to show an interest in the social life about her; and I have no doubt that in a little while she will find herself one of the most sought-after young women of her circle.

Here then are examples of how today the surgeon's knife can help even to set right the intimate and perplexing problems that arise in connexion with sex. There is nothing spectacular to describe in the actual operations, which by modern standards are, as a rule, extremely simple, since they merely involve the removal of this or that easily accessible structure. What has changed so remarkably is the attitude of both sides—public and medical profession. Today the public expect doctors to help them in their sex difficulties and aberrations, while the medical profession take such matters as part of the day's work. That they achieve success in so many instances in cases that older men would not have entertained is due not to the introduction of new and striking techniques, but to the steady and continuous progress in our knowledge of the way the human system behaves not only in health but in disorder.

CHAPTER XVI

The Surgeon Refuses

In the last chapter I quoted a case in which actual damage had been done to a patient through unwise psychiatric treatment. That does not mean, as I hope I have already made clear, that I disparage in any way the wonderful work that psychological medicine has performed in the past few years. On the contrary, the relation between the activity of the mind and the incidence of physical symptoms is of profound interest to both surgeons and physicians, who in the past recognized only strictly physical causations of disease. Indeed, today the surgeon himself has to be not unskilled in psychology if he is to handle his cases in the best possible way, especially if he is to adhere to the modern ideal of conservation and never embark upon an operation unless it is absolutely necessary. The conditions of the times, moreover, make such knowledge doubly necessary, for in these days of the aftermath of war and austerity living, there are few of us who have not developed some neurotic tendencies.

All this does not imply that the surgeon is seeking to compete with the psychiatrist. He is not—or should not. He needs psychological knowledge to protect himself from operations that may, at best, be merely unnecessary but harmless, or, at worst, bad blunders.

There was a case at a hospital where I spent a little time in my young days that shows how attitudes have changed when a comparison is made with the methods of today.

A woman was sent to the hospital with a diagnosis from

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her own doctor of acute appendicitis that needed immediate operation. He asked that a certain surgeon on the staff should perform the operation, for the two men were friends, and the general practitioner usually sent his surgical cases to this particular man. Between them there existed a state of mutual trust which events had well confirmed. There was nothing unusual in the fact, therefore, that the surgeon accepted the diagnosis without taking overmuch trouble to confirm it and ordered the operating theatre to be prepared at once.

The incision was made, and then it was seen almost at once that the appendix was perfectly healthy. There was no inflammation—not the slightest sign of anything wrong. But the appendix was removed and the operation completed. Afterwards the surgeon gave me a short lecture on the case, using it as a peg on which to hang a talk on the difficulties of diagnosis.

“By all the usual standards,” he said, “that was a clear-cut case of appendicitis. It was almost a textbook one. But you see how we were misled. My friend had no doubt about it, and, as you know, he is a good doctor. Nor had I the slightest doubt. We acted on the obvious and most compelling indications. You see what happened. There was nothing there. Well, such things do happen in practice, and you mustn’t be surprised when they do. We shall have to keep that woman under close observation for some time to find out what’s the matter with her. If there’s pain, there’s obviously something wrong . . .”

Retained in hospital she was subjected to almost daily examination. Nothing was found wrong with her, and eventually she was discharged as one of those cases for which medical science had no explanation.

Looking back on that case with all the experience gained in twenty years or more, and in the light of more recent knowledge, it seems to me a clear case of emotional disturbance. The abdomen has been described as the mirror of the

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emotions. If they are disturbed, the effect is reflected in the reactions of the abdomen. The complete signs and symptoms of certain diseases can be stimulated, and unless the surgeon is very careful in his approach, he may find himself betrayed into performing an operation that should never have been attempted, because there is nothing for him to deal with.

Everyone knows, of course, that emotion can profoundly affect the body: such simple things as a lump in the throat when we are deeply moved; and many people actually vomit under the stress of excitement, even when it is pleasurable. This reaction carried to extremes can actually assist the development of disorder in the body or retard healing when something is already the matter.

This is particularly true of gastric ulcers. During the war years, there was a large increase in the incidence of these, and to some extent undoubtedly the change of diet and particularly the alteration in the quality of the bread was responsible. But, at least to the same extent, the strain of living in the blackout under the constant threat of attack from the air, the long hours of work, and the general anxiety helped. It would probably be wrong to say that these psychological factors initiated the ulcers; it would certainly be right to assert that they created abdominal conditions in which their appearance was facilitated. A common experience of surgeons dealing with ulcer cases that have been operated upon is that, if the patient suffers some disturbing emotion, healing is inhibited completely, but as soon as the stress is relieved, normal healing is resumed.

One of the curiosities that recent research has established has a distinct bearing on the alleged appendix case quoted at the start of this chapter. It is that emotional disturbance, mirrored by changes in the abdomen, causes a spasm in the muscle walls and is revealed as pain in the right side in the area of the appendix. The reason for this is obscure, unless it be that everyone today unconsciously knows the signs of appendicitis, but of the truth of the statement there

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can be no doubt. These emotional pains occur twice as frequently in the region named as in any other part of the body—a fact that places the surgeon very much on his guard when, unsupported by any other evidence, a patient comes to him with assertions of appendicitis.

It might well be asked why all this is regarded so seriously by the modern surgeon. Twenty years ago people had appendices removed when they were not inflamed, so why should there be any trouble about the matter today? The answer lies in the change of attitude which makes the surgeon conservative in his practice. Nowadays he is never likely to advise an operation for its own sake, and he is just as anxious to avoid intervention, if that is the right course, as to make it. Every operation, however trivial it may be, imposes some sort of shock on the patient, which is better avoided unless it is absolutely necessary; and if the surgeon were to operate in every case simply on the patient's own assertions of pain, then in the end he might succeed in reducing the sufferer to a very low ebb indeed.

I well remember such a case a few years ago. A woman came to me asking for a general examination as she was subject to continued pains in the abdomen. At once I noticed that she bore several operation scars in the abdominal region, and immediately I set about investigating her history with the greatest thoroughness.

Some years before she had suffered from pains very similar to those of appendicitis, and eventually she went to a surgeon, who, having examined her, diagnosed the rather rare condition of chronic appendicitis. Just as had happened in the hospital case of long ago, he had found nothing wrong with the appendix when he had performed the operation, but he had removed it, and the improvement in the following few weeks was very marked. A little later she returned, saying the pains had recurred. This should have been a warning. It is impossible to have appendicitis when the organ has been excised, but he decided there might be adhesions. Once again

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she went onto the table and adhesions were discovered and removed. There was nothing significant in them; probably similar ones might be found in many cases after appendicectomies. Once again improvement set in.

When the pain returned again she consulted another surgeon, who made yet another abdominal intervention, though for what precise reason I could not discover. Now she had come to me, no doubt expecting that I would be able to perform the one final operation that would banish her pains for ever.

Here was a case that had to be approached with great care. Already she had had three operations, two of which were unnecessary, as was also, in all probability, the third. Their effects were already showing on her. She was in a very low psychological and physical state; chronic invalidism threatened her strongly. My examination showed nothing that would justify an operation, and I told her so frankly. She stared at me unbelievably, and then burst into tears.

That was another warning signal. Women do not, as a rule, burst into tears—unless they be tears of joy, which are rare—when they are told an operation is unnecessary. Safe though modern surgery is, no one deliberately goes out of his way to enjoy its benefits. There was something else the matter with her, and whatever it was it most certainly had no physical origin. All her ills, for which she had endured three operations, were what is known as psychogenic—born of the mind.

For the moment I turned psychologist and began to question her about her home life. It was, as I expected, unhappy. She had loved her husband to begin with, but they had drifted apart after the death of their first child, which was also the last, as they were now separated. With as much tact as I could, I persuaded her to see a psychiatrist, and later I had a report on the case. She was undoubtedly suffering from a guilt feeling as the result of the loss, first of her child, then of her husband. In her unconscious she held herself responsible, and the uneasiness and anxiety had shown itself in abdominal pains. Moreover, it had driven her to

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believe that she could find relief in surgery, which had something of the symbolism of suicide for her.

This was probably the most interesting and involved case of its kind in my experience, but it does show to what traps the surgeon is exposed if he limits himself to a belief in purely physical causes. The psychogenic ills to which man—and more particularly woman—is heir are legion, and the surgeon has to be constantly on the alert to detect them. Disturbances of the monthly female cycle are very common as the result of emotional upset, and this leads to a belief that the reproductive organs themselves are in need of operation. There have even been cases in which every pain has been regarded as cancer and many of the symptoms have been reproduced. During the war, such complaints were very common among wives separated from their husbands. If the surgeon had operated on all of them, his hands would have been more than overfull.

Often, too, the surgeon has to apply psychology in order to enable him to do his work properly. Nothing is worse than to have to operate on a patient whose mind is worked up to a state of tension. Victims of cancer are apt, as we have seen, to take a very gloomy view of their prospects, and this may retard their subsequent recovery unless they are brought to the right frame of mind before the operation is begun. Very frequently, because he knows the value of psychology, the surgeon himself can induce this state by his attitude and suggestion, but sometimes it is better for him to seek the aid of a professional psychologist; the mere fact that advice and encouragement come from a specialist other than the surgeon himself has a soothing effect on the distracted patient.

All these and similar cases are examples of occasions on which the surgeon must know when not to operate. It is a task calling for fine judgment, and entails great responsibility. He has to be perfectly sure that the signs and symptoms are indeed psychogenic before he refers the case elsewhere. Just as it is wrong to accept the patient's or another

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doctor's diagnosis without proof, so it is equally wrong to run to the other extreme and jump to the conclusion that the trouble is psychological in origin. A single scrap of evidence overlooked may lead to trouble, and a patient who should have been operated upon may waste much time and trouble in psychological treatment, at the same time increasing the hold of the ailment upon him.

Luckily there is not very much danger of this in these days, now that so many scientific and impersonal aids to diagnosis are available. None the less, many surgeons feel that, in cases of doubt, it is better to seek a second opinion before the final decision is made.

The moral of all this is that the modern surgeon has to have the courage of his convictions and know when to refuse to operate. If he does so he may, it is true, invoke the wrath and displeasure both of the would-be patient and the doctor who has referred the patient to him for advice, but these are comparatively small matters beside the all-important one of ensuring that his skill is not put to improper use; and surgeons who do act thus honestly and with conviction are not likely to lose in the long run, because it comes to be recognized that their opinions are worth having. On the other hand, the one who, following the older practice, takes all physical signs at their face value and uses the knife on the slightest provocation is not calculated to improve his reputation.

The invasion of psychology into surgery is another example of the way in which all the branches of medical science are coming together and forming a single force to combat the complaints of mankind. The surgeon assists the psychiatrist and vice versa. Neither is entirely independent of the other, and the best results will come when there is the freest interchange between all the various branches without any sense of lost pride. What matters is the patient's health; the means by which it is attained are immaterial so long as they are the right ones to ensure complete recovery.

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This attitude, rapidly gaining ground, would have been almost inconceivable in my early days. The surgeon who removed the healthy appendix would have been shocked had he known that his young assistant would one day refuse to operate when so many signs pointed to its necessity, and, instead, began to investigate the patient's state of mind. For this, that erstwhile student claims no particular credit. He was acting according to the knowledge of these later days and seeking to apply, as all surgeons must, the best means for the end in view.

CHAPTER XVII

Scientific Sleep

When one looks back over twenty years of surgery one is impressed by many brilliant and striking new procedures that have made the impossible of one's youth the commonplace of one's middle age. These have been referred to in previous chapters. But still more, when one assesses it all quietly, the factor that strikes one as the most important in the advance of surgery is the sum result of a number of detailed improvements in technique: better instruments, for example; new accessories, such as the Miller-Abbott tube. It is these which have helped to make surgery safer and easier in the ordinary run of routine operations—and it is these interventions, after all, which have the greatest and most immediate value to the majority of sufferers. For every one who has to have an operation performed on his brain, there are perhaps several hundreds who must have their appendix removed. It follows, therefore, that if the whole technique of appendicectomy is improved and streamlined, there will be many more beneficiaries than there will from some new sensational procedure for interfering with the brain—an operation, it may be, that will be performed only once in a year or less even by a specialist who deals with nothing but brain cases.

Among the detailed improvements that have done much to make surgery better and safer are those in the field of anaesthesia. In these days it is almost incredible, even to a surgeon, that it was ever possible to carry out major operations

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while the patient was still fully conscious. The atmosphere of the old operating theatre must have been more like that of a torture chamber than anything else. Still more remarkable is it that any of the patients survived the treatment. The surgeon must have had nerves of steel and an absolutely ruthless determination, as also must his assistants, whose attention was not so absorbed in the work on hand.

Yet for all that, anaesthesia had to fight hard for recognition, and even today there are some people who assert that it is immoral to use an anaesthetic to ease the pangs of childbirth for a woman—a point of view that seems very strange in these enlightened days.

By the time I qualified, of course, anaesthesia had been a standard practice for very many years, and a quite elaborate technique had been evolved. Yet for all that, there was room for improvement, and the resources of the contemporary anaesthetist were quite beyond imagining, except perhaps as a dream of a world that was ideal for surgeons. Chloroform was still in use to a limited extent, though it had been largely abandoned. As we have already seen, it is apt to have disastrous effects on the liver and cause complete collapse of the patient. Ether was employed, especially by nurses and first-aid workers, to relieve pain when necessary. Others in use were gases, given from cylinders through a mask and producing complete anaesthesia. Nitrous oxide was given mixed with oxygen. Already the anaesthetist had become a specialist.

There were, too, local anaesthetics, of which novocaine was the chief, as it has remained to this day. But it was used principally for minor operations. The idea that it might be adopted for major interventions—that the patient might remain fully conscious even while extensive work was performed on his stomach—was staggering to many surgeons, though already pioneers were showing the way.

I well recall the interest that was aroused at this time by the introduction of the barbiturate series of drugs. These represented an attempt to break away from the classical

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pattern of gas anaesthesia, the disadvantages of which were already apparent, even with the most perfect gas then known. These gases act on the brain cells, and that cannot occur without there being reactions throughout the body. The extent of these adverse effects on the abdominal tract is sometimes very marked, which is one reason why many surgeons today prefer to use local anaesthesia for many abdominal interventions.

The barbiturates seemed almost ideal. They left no after ill-effects but were completely eliminated. They could be administered either by the mouth or by injections without all the paraphernalia of the anaesthetic machine. The patient could be put to sleep before he even left the bed in his ward. A new era was dawning in anaesthesia. If the barbiturates lost their popularity, partly because some of them were found injurious, it was largely because other and still better media were made available by the ceaselessly fertile minds of the research chemists.

Another newcomer of the same era was avertin, an alcohol which is injected into the lower bowel. Avertin remains in use today for certain types of operation, but its popularity, too, has passed. In many ways it was ideal, and I recall the pride with which it was adopted by the surgeons of my hospital of the time, men who believed in keeping abreast of the time. But avertin has one serious drawback. Once it is injected and the patient has been put to sleep, nothing more can be done. There is no means of regulating its action. It is a once-for-all anaesthetic.

Attention was turned again to the barbiturates, but in a new way. Now instead of being given as a medicine, they were injected into the blood stream. Success was attained, but the element of lack of control remained as a drawback. Some of them were so powerful that the patient would be asleep before the needle was removed from the vein; yet for all that, they were almost completely harmless and the body destroyed them by normal means.

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This was a significant step, indicating the new approach. The ideal anaesthetic could now be specified. It would be easy to administer, preferably by injection. It would create no dangerous toxic after-effects. It would be rapid acting. But above all it must be controllable, so that the anaesthetist could always keep the patient under the right degree of unconsciousness. The search led to pentothal, but pentothal again is not completely controllable. It has retained its place in the armoury, however, for it is ideal for minor operations. It has been employed for major ones, but it is generally regarded as unsuitable. Nevertheless, it was ideal for war surgery, especially as it can be combined with plasma injections needed to combat shock. One can hardly imagine surgery without its aid today.

Let me turn back the pages of time a little to those early days of my career. A good many anaesthetics were available, but their use was limited to the operating theatre, the dentist's surgery, and so on. They were rarely used unless they had to be—and so, even twenty years ago, there was more unnecessary suffering in wards than there is today. Changing dressings often imposes considerable pain on the patient, for they may have become adherent to the wound; and sometimes the surgeon has partially to reopen an incision for the removal or adjustment of a drainage tube. To me, as a young man, these minor sufferings seemed far more terrible than the work in the operating theatre, where, however extensive the operation, the patient knew nothing about it.

Pentothal has certainly altered all that. A small dose of pentothal induces a state of twilight sleep, during which these painful yet vital adjustments can be carried out. There is no adverse effect on the patient; indeed, his recovery is aided, for he is saved the anxiety and strain of the dressing, which, in cases of burns, can be extremely distressing.

But for major operations, pentothal is not suitable, largely because it can have a disastrous effect on the respiration if enough is given to induce really deep anaesthesia. That is

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why, more and more, the tendency is towards spinal anaesthesia, which is under control and puts the patient in that state of complete relaxation which is so helpful to the surgeon, especially in extensive abdominal operations.

Continuous spinal anaesthesia is effected by inserting a long needle into the great nerve trunks round the spine and connecting it to a rubber tube, which, in turn, is joined to the source of anaesthetic. Sufficient of the fluid is run in to produce the desired state. The anaesthetist has the patient under complete control. He can apply more anaesthetic if conditions demand. Nor does this method necessarily put the patient entirely to sleep; his brain is not affected. The nerves controlling the various parts of the body spring off at different levels of the spinal cord, and the paralysis induced by the anaesthetic spreads slowly upwards as more is applied. Thus, the anaesthetist can limit the anaesthetized area to exactly what is required—that and no more. Only the affected parts are concerned. This is a gain of considerable importance in some types of operation. For patients suffering from respiratory complaints, especially old people, who could not survive a gas anaesthetic, the system is practically ideal.

From this method has sprung yet another—the caudal anaesthetic. This is injected into the base of the spine, and by its aid patients can be harmlessly held in a state of semi-anaesthesia for hours on end. This method is proving of immense value as an aid to childbirth, for which most forms of anaesthesia are unsuitable because they prevent the muscles from acting properly in the complicated process of delivery.

Actually, of course, continuous spinal and caudal anaesthesia are developments of local anaesthesia, which today is almost a science of its own. Novocaine remains the chief agent for this purpose, usually in association with adrenalin to offset the depressive effect on the heart. By the aid of novocaine even the most involved operations can be safely carried out, and there are practically no limits to the possibilities of its use. Often the patient is put into a condition of

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twilight sleep before entering the theatre; he feels nothing and knows nothing, not even the slight prick of the first needle puncture. Whole regions of the body may be blocked off by injection into important nerve ganglia, or small parts, such as a single finger or even a tooth, can be anaesthetized.

Today, then, choosing the right anaesthetic for any particular operation is a matter requiring much thought. The anaesthetist has, in fact, become a specialist in his own right, and before any important operation the surgeon consults with him as to the proper method applicable to the case. Not only the type of operation has to be taken into account, but also the condition of the patient. The degree of anaesthesia required has also to be decided.

But the anaesthetist is not simply the doctor who puts the patient to sleep. He is also in a special sense the guardian of the patient's life. His training and experience enable him to detect the slightest sign of danger, and many a person owes his life to the watchful eye of the anaesthetist who has noticed instantly the almost imperceptible stumble in the heart beat or embarrassment of respiration.

It is not often nowadays that such disasters occur, but when they do, the surgeon and his team are ready for them. One of the most powerful means of restoration is provided by adrenalin, which, as we have already said, is a hormone derived from the adrenal glands. It stimulates the heart to action, and it has saved many lives. If this fails there are more drastic measures.

In those early days of mine, I remember a case in which an elderly man was undergoing an extensive operation on the stomach, involving a resection and joining of the ends. All went well in the hands of the experienced surgeon performing it, but towards the end the anaesthetist suddenly gave a warning. Immediately restorative measures, including adrenalin, were applied, but though everyone worked energetically the patient died. It was a tragedy that had nothing to do with carelessness or lack of skill; it was, as the Americans

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say, "just one of those things". At that time, the occurrence, though already rare, was accepted fatalistically as unavoidable when it did happen.

Would that patient have survived today? Of course one cannot give a definite answer to that question, for these matters do not obey hard-and-fast rules. I can only say that he might have had a better chance.

Not so very long ago I was operating in very similar circumstances, and towards the end of the long abdominal procedure it became evident that the patient was in danger. Adrenalin was applied, but without much effect. The heart stopped. There the matter might have been considered hopeless. But I recalled that a famous British surgeon not long before, faced with a similar emergency, had reached up for the heart and gently massaged it to life again.

I decided to try the method. With bated breath, my assistant and the anaesthetist watched, and it was a thrilling moment for me when, at last, I felt a slight pulsation in the heart—a pulsation that grew steadily until at last it continued unaided. The beat was weak and slow, but there was a beat. In due course, with careful nursing the patient was discharged, and it was not until then that he was told how near he had been to death—if, indeed, he had not been, according to older ideas, actually dead.

Yes, the science of sleep is involved today—a specialist's job. But side by side with its progress has gone also its complement—the science of resuscitation, the recalling of threatened patients from that eternal sleep of which Hamlet spoke so eloquently.

CHAPTER XVIII

Conquering the Fatal Clot

The operation had been entirely successful, and I remember that I was very pleased about it, for it had been the first really major one in which I had been permitted to act as assistant to the surgeon. It had been a fairly extensive intervention on the stomach of a man of fifty-seven, and I recall that the surgeon himself, one of the best of the day, had been a little anxious about the case, for twenty years ago abdominal surgery on patients of advancing years was attended by much more risk than it is nowadays. But the fears had proved groundless. The man made a splendid recovery during the post-operative days. He had progressed steadily, apart from a short period, just after the operation, when his temperature had risen slightly though not at all dangerously or indeed entirely unexpectedly; such slight fever was not uncommon. Now, after a long period in bed, he was about to get up for the first time; it was a great day for him as well as for me.

It was then that the tragedy happened. He had been out of bed a few minutes and had been cracking a mild joke or two about his weakness, when suddenly he gasped sharply, as though someone had punched him in the pit of the stomach. Next moment he was fighting for every breath and he was obviously in intense pain. As we lifted him back on to his bed, I noticed the most dangerous signs of all: his lips and the lobes of his ears were turning blue, the warning that the body is growing short of oxygen. Then, indeed, we knew that

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the case was practically hopeless. Our patient, in whose recovery we had taken so much pride, was dead in a few minutes, the victim of one of surgery's most insidious and feared enemies—embolism.

Embolism was, until recently, one of the darkest spots in the whole picture of surgery. It came suddenly and without warning, even, as in this case, to patients whose recovery had seemed almost complete. Its incidence was unpredictable and there seemed no rules by which one could say that its threat was greater in some cases than in others. And when it came, perhaps weeks after the actual operation, there was nothing that could be done about it. One could but stand by and watch the patient die before one's eyes. It was no wonder that every surgeon went in dread of its occurrence. In a few minutes it could turn a successful case into a fatality, setting all the surgeon's skill and knowledge at naught.

In embolism, as those blue lips show, the patient dies from lack of oxygen, and he is deprived of that essential gas by the occurrence of a heavy, dark clot of blood that blocks one of the veins serving the lung. As a rule, only one lung is affected, but the arrest of the vital oxygen supply through the blood stream is complete. In a very short time, death supervenes. So much had been known for a long time, but no successful method of dealing with the situation had been devised.

There is more involved than simply the blocking of a single pulmonary vein, for if this were all it is unlikely that death would come so speedily, even if it occurred at all. People live with only one lung and suffer no discomfort. What happens in embolism is that when the stoppage of the vein takes place, a spasm passes through the blood vessels over a wide area, causing them to contract and so interrupt the circulation at its most essential point. The clot, in fact, causes a form of shock—that other great enemy of the surgeon which has been conquered only in recent years.

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Embolism does not occur only in the lung veins. It is not infrequently met with in leg blood vessels, for example. But there the clots, or emboli, can be dealt with, for the spasm can be controlled by injections into the sympathetic nerves and subsequent operation for the removal of the embolus. This method is theoretically possible for pulmonary embolus, of course, but in practice it is virtually impossible. The onset is so rapid and unexpected, and death comes so swiftly, that by the time the theatre is ready for the patient, he is already past human aid. It seemed as though this deadly threat must always remain to mock at the rapid progress in surgical techniques and in the steadily increasing success the scalpel was winning in the war against disease and suffering.

Yet it was not likely that research would easily admit defeat in a matter that was so important. The very mysteriousness of the problem, its seeming intractability, was a challenge which was taken up in many different countries. One by one the other problems of surgery were being swept away; it was a blemish on the record that this one should remain; and, as always happens when a problem of this nature is subjected to systematic and widespread investigation, step by step the answer was worked out.

Quite early in these inquiries it was recognized that the problem of pulmonary embolus was connected with another one that had long been a puzzle to surgeons and a fruitful cause of trouble—femoral thrombophlebitis, which is an inflammation of blood vessels of the leg that occurs during the post-operative stages and—more frequently—in women after childbirth. This, too, causes a clot. It was noticed that if the victims of this condition, complaining of pain, had the obvious immediate treatment of light massage applied, a pulmonary embolus sometimes resulted, just as if the gentle pressure had loosened the clot and sent it on to the lung veins where it formed a fatal blockage. Phlebitis was, at one time, a most serious condition that could leave permanent disability and disfigurement to its victim.

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The clue given by this was eagerly followed up, the argument being that pulmonary embolus was probably always preceded by phlebitis. The whole problem was examined anew in this light, and little by little the general state of affairs was elucidated—and, as so often happens, it was found that what appeared a complex and confusing condition was basically quite simple to explain.

In phlebitis the veins become inflamed for some reason, and spasm of the blood vessels is induced, so that the return flow of blood is arrested. When this was discovered, a method of dealing with the situation was evolved. Today, therefore, this distressing condition yields to quite a simple procedure.

There was a case of this acute thrombophlebitis in the same hospital as that in which the fatal embolism occurred—a case I remember well for its unhappy outcome. The patient was an attractive young woman, the wife of a rising lawyer for whom a very great future was predicted and who made a devoted and adoring husband. She had come to the hospital to have her first baby, and the confinement had been a bad one, so she was retained for observation and treatment. In a little while the unwelcome signs and symptoms of phlebitis developed. Her left leg became red and swollen, and she complained of intense pain in the limb. High fever accompanied all this, with all its painful and uncomfortable effects. The girl—she was only twenty-one—spent weeks in hospital, and though she had the best treatment then available, she was discharged, after weeks of suffering, with a leg so crippled that she could barely walk—and it was certain that she would remain like that all her life. Scarcely able to move, she could not look after either her child or her husband.

Some six months ago in the maternity wards of my hospital in London, a woman developed precisely these same symptoms after her delivery, but this time there was no thought that this patient might become a cripple. She was taken to the operating theatre and arranged face downwards

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on the table. Then I carefully located the vertebrae of the lower back and marked out a space two fingerbreadths wide round each. With a syringe the space was injected with novocaine to induce local anaesthesia. Next, a long needle was pushed down painlessly till it encountered the bones of the vertebrae, and three similar ones were afterwards inserted at each of the corners of the marked-out square. Through these needles novocaine was infiltrated. This reaches the sympathetic nerves, causing a reaction which enlarges the constricted blood vessels.

The effects of this simple procedure are rapid. The pain disappears almost at once; the affected limb begins to grow warm and the circulation recommences. Every eight or twelve hours the injections are repeated, and within a few days all the distressing features of the condition have gone. In the case I have mentioned, after a very short time an elastic bandage was put on the leg and the woman was encouraged to walk about the ward in order to help the restoration of a normal circulation. When she left the hospital her leg was normal. What would have involved weeks of suffering and perhaps the worst possible permanent effects twenty years ago had been cured in less than a fortnight, during which the patient had experienced practically no pain at all—surely a signal triumph of modern surgery.

Here was one answer, it was felt, to the problem of pulmonary embolus, for it had been established that when the phlebitis was mild, emboli often followed. The state of affairs appeared to be that in severe attacks of phlebitis the clots adhered to the veins of the leg, but in milder ones they passed into the circulation to do their fell work in the lung veins. This was a notable advance. If phlebitis appeared and could be cured, then the risk of pulmonary embolism was practically ruled out.

That, however, did not explain those cases in which sudden death occurred without the premonitory warning of phlebitis, and it was these which the surgeon most feared. Only a

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fraction of the surgeon's main problem had been answered, in fact. But patient research was finding the solution. Data showed that nearly three-quarters of the people who died from embolism were over fifty years of age, so research workers made a special point of keeping older patients under the closest observation. This led to the discovery that in seventy per cent of the fatal cases there had been a warning—so slight that it had been unnoticed, or, rather, unrecognized for what it was, a preliminary embolus. The temperature rose with pain in the chest, and signs and symptoms showed that were often dismissed as "slight pneumonia" or "pleurisy". Moreover, it was found that of four patients who revealed these indications of preliminary embolism, three would die if a second occurred. The final discovery that threw a flood of light on the whole situation was that when post mortems were made on those who had died from pulmonary embolism, loose clots were invariably found in the deep veins of the leg.

Surgery had at last a reply to the threat of embolism. It was not, as had been thought, entirely unpredictable; on the contrary, it gave ample warning of danger in those signs which had hitherto passed unnoticed. A simple test was devised for demonstrating the preliminary embolus: if the ankle was flexed upwards so that the calf muscles contracted, pressure on the affected deep vein caused distinct pain. The signals could be read: what was the treatment to be?

Obviously means had to be found to arrest the passage of those clots into the general circulation. This could be effected by interrupting the leg vessels themselves, thus preventing the back flow of the blood. To open the thigh, pick up the great femoral vein, ligate it, and then cut it in two, seems a pretty drastic procedure, but it has proved effective, for not only does it block the path between the clots and lungs, but also, by severing some of the nerve fibres, it helps to relieve the blood spasm and so aids the circulation remaining—just as the novocaine treatment for phlebitis docs. Nor does this

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seemingly extreme method endanger the circulation of the leg itself. The body is well provided with alternative blood vessels, and if one vein or artery, even a large one, is closed, the circulation soon works through another route, as has been pointed out in connexion with varicose veins.

To make assurance doubly sure in diagnosis, X-rays have been called in, a new technique known as phlebography having been developed. Chemicals are injected into the blood so as to make it cast a shadow on the fluorescent screen or photographic plate, and the signs of obstruction can be seen. Hence the exact site of the clot can be established and the operation performed at the best level.

If embolism, with the introduction of this procedure only a very few years ago, lost much of its former terror, there were still cases that proved fatal. In some of these it was found that the clots had escaped from the leg veins before the signs of preliminary embolism appeared, so the operation sealing off the leg veins was inappropriate. Modern surgeons, however, do not fear even that state, for today it is possible even to tie off the great vena cava, one of the largest vessels in the body, taking the returning blood circulation from both legs. It needed high courage to attempt this operation, but it is performed today whenever it is necessary, and successfully crowns it. There are ample routes by which the circulation can be maintained.

This, then, is the surgeon's answer to a condition that much less than twenty years ago still claimed practically all whom it affected for death. The fatality statistics from embolism have decreased rapidly. None the less, mortality still occurs. There are cases in which no warning at all is given, and so the procedures described are of no avail. The clot does not reveal its existence until the moment of striking. For such cases, however, the chemist is providing an answer—an answer that may, in due course, make even the operations themselves unnecessary. Two substances, heparin and dicoumarin, have been isolated that have the property

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of reducing the clotting power of the blood—the reverse of the effect of Vitamin K. These can be administered at the very first signs of the onset of embolism, and evidence so far collected shows that this course is highly effective, saving lives that would certainly have been lost before.

When a problem of cure like this has been discovered, there is always another question luring the research worker on to fresh efforts. That is, the problem of prevention. It is the ideal that medical science ever sets before it. To cure is wonderful; to prevent is better. It is an old belief, and it is only today that the ambition it expresses is being realized.

Obviously, the best thing in operative cases is to take steps to prevent any likelihood of embolism. It may be that the anti-clotting thrombus-inhibiting drugs mentioned provide one solution of this problem. But a simple and valuable method has already been discovered and is today widely applied. A clue was given when the cause of clot formation was being examined. Clot formation is favoured when there are slow-moving pools of blood—that is, when and where the circulation is not brisk. Now, as the chapter on varicose veins pointed out, the return blood system in the leg is dependent on the gentle lift given to the veins by the muscles. After an operation, the patient is practically immobilized, sometimes for long periods—a state of affairs that decreases the rate of flow in the leg veins and invites the clots to form. Additional evidence of this is given by the fact that pulmonary embolism occurs with as much frequency among patients who have been bedridden as it does in those who have been operated upon.

Modern practice, then, endeavours to cut short the immobilization period to the minimum. In a day or two after even a serious operation the patient is got out of bed. This simple means has proved of great value, not only in keeping the leg veins in a healthy state, but also generally. The old idea that an operated patient should be kept in a very quiet state for weeks is being abandoned, with benefits all round.

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Here, once more, the now familiar pattern is repeated. What was fatal twenty years ago is not merely no longer so, but is under almost complete control, and the path to prevention is already being explored.

The conquest of embolism removes the most dreaded danger of surgery. No longer need the surgeon go in fear, after some operation that has tried his skill and patience to the full, that death may snatch its victim by another means. If medical science has not yet conquered death, at any rate it has today closed many of the doors through which is used to make its entry.

CHAPTER XIX

Making the Deaf to Hear

Just as there are some diseases, notably cancer, which hold a special terror for the man in the street, so that he tends to take the most hopeless view of them, so there are certain operations which fill him with dread—operations that he regards as little better than death itself. I suppose the radical mastoid operation is one of these. The mere mention of the word “mastoid” makes the layman shudder.

Certainly there is some reason for this belief, though, like so many beliefs of its kind, it is based on what used to be, rather than what is today. If there was once justification, and not so long ago at that, for shrinking in fear from a mastoid operation, there is none today. Dealing with mastoid disease has been revolutionized, like so much in surgery. No similarity with the older procedure exists. This is a truth that should be widely known. It is well brought out by comparisons between the old and the new.

But what is the mastoid and what is mastoid disease? The mastoid is the slightly protuberant bony structure just behind the ear, and behind it lie, in fact, the delicate mechanisms of the middle and inner ear. In mastoid disease, inflammation occurs in the bone, and in due course pus begins to accumulate if the condition is left unchecked. This is serious enough itself and is responsible for the almost unendurable pain to which sufferers are condemned. It is not, however, the worst. As the volume of pus grows, so its pressure rises, and it seeks a way of escape, forcing itself not

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only into the ear, where it may cause permanent deafness, but also into the brain cavity itself, with final results that may be even more disastrous.

The only way the older surgeons had of dealing with acute mastoid disease was to remove the whole of the mastoid process itself. The procedure was drastic, and the mortality rate was high. Moreover, the treatment left a huge, disfiguring scar, and those who survived the operation were far from good to look upon. The only thing to be said in favour of the operation was that it could save life, and that it was a desperate remedy for a desperate disease. To those who successfully endured it, in fact, it often brought tragedy.

As a young surgeon in Italy twenty years ago, I witnessed an operation of this kind that will remain for ever in my memory. It was not so much the operation itself—after all, I had seen it before and have seen it since on many occasions—as the effects it had on a young and promising life.

The patient was a boy but twelve years of age, named Giovanni T—. He was no ordinary boy, but a celebrity with something more than a local fame, despite his youth. Giovanni was looked upon as one of the finest young violinists who had ever come out of Italy. Before his years had reached double figures he had already given public concerts. Only a year before, he had played publicly in Rome and received laudatory notices from the critics. His was a life full of immense promise, some of which he had already redeemed. In many ways, we, who lived in his own city, regarded him as a tutelary deity, and the news that he had been brought to hospital suffering from mastoid disease spread with all the rapidity of the announcement of an outbreak of war—and produced much the same feeling of gloom and depression.

Giovanni's was a bad case. The trouble was bilateral—that is to say, it affected both sides of the head. He was in intense pain, and it was clear even to the eyes of the youngest and least experienced of us that an operation would be necessary. Enrico T——, his father, was not himself a rich

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man, but his youthful son had begun to draw considerable fees. He demanded the best attention for his boy, and gave evidence that he could and would pay for it. He pointed out with all an Italian's passion for music that what was at stake was not simply his son's life, which was reason enough for the best, but also the world's right to enjoy his son's talents.

We had on the staff a professor who was a recognized authority on ear diseases and a specialist in mastoid operations. No better man could be found anywhere, though Enrico demurred a little at first when he learnt that no one was to be fetched from Rome. Provincials the world over have a habit of regarding the capitals as possessing a monopoly of professional talent. Like prophets, doctors are usually without honour in their own country.

The professor examined the boy, though I imagine that his mind was already made up at a glance at the case history supplied by the family doctor. Of course, there had to be an operation. Moreover, as so much bone was involved it would be an extensive one. In guarded terms he told Enrico not to be too confident of the outcome. The rate of recovery from such operations was not, and could not be, very favourable in the nature of things, since the interference with the system was high.

The operation itself was successful. The condition of the boy was worse even than the professor had expected. It was difficult to understand how so much pus could have been held within so small a space. It was an object lesson of the seriousness of the disease, and the professor gave another object lesson in the difficulty of the operation.

Then began a stern fight to save the child's life. Several times it was despaired of, and I doubt very much whether, in hands other than the professor's, he would have survived. But in the end, the resilience and resistance of youth responded to the high skill and devoted care of the hospital staff. He was discharged and taken back to the bosom of his anxious but now overjoyed family.

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The professor had worked an apparent miracle. He had, too, done what he had been asked to do: he had saved Giovanni's life. This was true and could not be denied, and it was a proper occasion for congratulation. But Giovanni the violinist, the boy who was destined to conquer the world with his bow, was dead. For the operation had left him stone deaf. The delicate mechanism of the ear had been so involved that it had to be removed as well as the diseased process. To a violinist that was the end, for there is no instrument that calls for a more subtle ear than the violin. Giovanni's beautiful hands were unaffected; he had lost the power to guide them. It might be true, as someone pointed out, that Beethoven himself was deaf and never heard his ninth symphony, but Beethoven was a composer and created his wonderful sounds in his own head.

If Giovanni had been born twenty years later, would his case have been different? It is extremely likely that it would have been. The operation for mastoid is a very different thing today.

It is only a very few years ago since I saw the first operation of the newer kind performed in this country. The patient was quite young, and the disease had secured a firm hold. He confessed that he had delayed advice and treatment for the simple reason that he believed an operation was the only means of dealing with his trouble, and, as he put it, he "did not want to face the butcher's shop". The surgeon had laughed, and explained to him how simple and safe the new procedure was.

Certainly, as I watched that operation, there was no comparison with what I had witnessed twenty years before.

All that the surgeon did was to drill a hole through the bone to the structures beneath, where the inflammation had occurred. Through this hole a quantity of penicillin was introduced. That was all for the time being. The patient was put to bed and the magic penicillin was left to do its work of fighting the virulent germs and reducing all that poisonous pus to impotence.

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When this had been done, a second intervention was made. This time a very small piece of bone was removed in order that the now harmless pus could be drained off. This completed the operation and the patient in due course was discharged from hospital perfectly cured and with his hearing unimpaired. Nor was he in any way disfigured. The small scar behind the ear that this treatment leaves is quite inconspicuous.

I was with the surgeon when he made the final examination, and told the patient the cure was completed.

The man laughed a little shamefacedly. "You don't know how grateful I am to you, doctor," he said. "But you must think me an awful fool, and a coward, too. I always thought that the mastoid operation was a terrible thing, and I almost believed it better to die. I'm not sure I wouldn't rather go through it all again than face the dentist."

My surgeon friend laughed. "Yes, a lot of people have that idea," he rejoined. "Now you'll be able to tell them that it's all wrong. I agree with you that it used to be pretty terrible, but penicillin has changed all that, as it has so much else. I'm not sure that it isn't taking away the surgeon's livelihood." He smiled quickly. "You don't need to worry about death in connexion with mastoid now, you know. Since we adopted this new procedure, there are practically no fatal cases at all—and when there are, they happen to the sort of people who would probably succumb to any sort of surgical intervention."

The man nodded thoughtfully, thanked the surgeon, and went away. As he did so, I could not help thinking of Giovanni T—— and what the world might have gained if penicillin had been known at the time of his illness. . . .

There is another terrible condition of the ear known as autosclerosis. In this, the narrow canal of the ear closes in and becomes filled with fibrous tissue so dense that it makes hearing impossible to its unhappy victim.

I made the acquaintance of this sad condition when I was still a student. A case was sent to the hospital where I was

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studying, and the professor shrugged his shoulders when he saw it, and diagnosed the condition.

"This is one of those occasions, gentlemen," he said, "when one has to be humble and acknowledge one's limitations. You are now in the presence of a condition for which there is no possible treatment. The ear cannot be operated upon for it. Nothing can be done."

He passed on his way to the next case.

Some years later, when I was a neophyte surgeon, I had almost the same words repeated by an ear specialist in my hospital.

"Autosclerosis," he said, with the air of a man who has seen the end of all hope. "Untreatable. Inoperable. Nothing can be done."

Until a decade ago, professors were telling their students, and consulting surgeons were informing their unhappy patients, that nothing could be done for autosclerosis. It was beyond the wit of man to devise any sort of treatment. That was what they said and believed.

But it was not beyond the wit of the great American surgeon, Lambert, who about ten years ago introduced the operation now known by the very apt name of fenestration. Fenestration means the making of a window, and this is just what the surgeon does, both literally and figuratively. He opens, with his instruments, a little window in the bone; he also opens a window that admits to the erstwhile victim of stone deafness all the miraculous sounds of the earth, from the symphonies to the song of the blackbird on a spring morning.

Some six years ago an old friend of mine, a retired sea captain, developed autosclerosis and came to see me to ask if anything could be done. It had made him stone deaf; the only way of conversing with him was to write down on a piece of paper what one wanted to say. His own fine brassy voice was, of course, unaffected, though, as he could not hear it, it tended at times to become overloud. Now if I had repeated what I had learnt as a student I would have

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pencilled on a piece of paper: "Sorry. Nothing can be done"—and passed it to him, knowing that though he might, in the disappointment of the moment, express his views strongly on the point of surgical incompetence, he would finally take it philosophically and courageously.

It so happened, however, that only a few days before I had been talking to an old colleague of mine who had recently returned from the United States, where he had been specially to watch Dr. Lambert perform this new operation of fenestration. New prospects had been opened up, he had said enthusiastically; and as he was a great specialist in this field and had a deserved reputation for taking nothing on trust, I felt that another of surgery's problems had been solved.

So I did not write the sentence of doom on my slip of paper for the sea captain. Instead I sent him to see my friend; and when subsequently I heard that my colleague was going to perform the operation, I asked if I might be present—a course to which he instantly agreed.

It was absorbing to watch. A hole is bored through behind the ear until the internal ear is reached. This sounds simple, but the aperture must be precisely placed, something calling for great skill, and, furthermore, the greatest care has to be taken not to do irreparable damage. When this has been done, the three small bones in the internal ear are deftly extracted—and the operation is over.

What has been done is that a new canal has been made to admit air, and therefore sound waves, to the mechanism of the ear. All of the closed canal is bypassed, and normal hearing is restored as though by magic. Nor is there anything disfiguring about the operation, for the scar is small and inconspicuous. Even if this were not so, however, I do not think many people would hesitate for long between having their deafness cured and the risk of disfigurement.

As I have said, that took place six years ago; and since that day my sea-captain friend has enjoyed perfect hearing, nor has he suffered any discomfort. That he is able so fully to

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enjoy his years of retirement after an active and vigorous life spent all over the world is due very largely to the skill of the surgeon who gave him new ears.

This type of fenestration removed another condition from the list of the inoperables, but it did not represent surgery's final answer to the problem of autosclerosis. The same bold pioneer has now introduced a later development. Once again my friend the ear specialist journeyed to America to study the new procedure at the fountain head. This happened very recently, and though the operation is expected confidently to give results at least as good as the older one, it is as yet too soon to say definitely that this is so. There is every reason to believe that it will.

Once again it was my good fortune to supply my friend, on his return, with one of his first cases on which to demonstrate his new skill, and once more I was present at the actual operation. There are, I think, at this time fewer than half a dozen surgeons who can undertake this treatment.

The patient was a young Indian girl of nineteen years of age, who had been born in Kenya, where she had spent all her life with her parents. When she was four years old she had contracted measles, and the attack had been very severe. Now measles of the severest kind can be a very damaging disease, and it certainly wrought havoc with this ill-fated child. Both her ears were so badly affected that autosclerosis set in, and she had been stone deaf for fifteen years of her short life. Coming at such a young age, the deafness was a great tragedy, for, since she could not hear a single sound, she had never been able to speak. She was a deaf-mute to all intents and purposes, not because she lacked the means of speech, but because the only way to learn speech is by imitation of heard sounds—and she could not remember ever having heard any sounds.

Her affliction had influenced her in many ways. She had that rather dull, lethargic look that is typical of deaf-mutes, who are, to all intents and purposes, shut off from the world.

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If she had been able to learn something from books, she had been deprived of the essential element of education in the child, which is asking questions and hearing discussions. One could not, however, say she was unintelligent. She simply had no means of developing her natural talents, whatever they might prove to be.

My friend examined her and decided that it was a case in which, if the parents agreed, he could employ the new technique. He did not disguise from them that it *was* new, that relatively little experience had been gathered of its final results. But he did hold out the hope that it might give the girl the power to hear. The parents did not hesitate. If there was a chance that this curse could be lifted from their daughter, then anything, no matter how drastic or even risky it might seem, was worth trying. That was one reason why they had made the journey from Kenya to London.

I found this operation even more fascinating to watch than the other one. It does not so much provide a new ear as restore the existing one. The penetration is made not through the bone behind the ear but through the ear itself. A specially designed and ingenious instrument is used to reach the internal ear, from which the collapsed bones are removed. There is, of course, no scar at all with this procedure, for everything is done internally.

Anxiously we awaited the results. The girl had taken the operation well, and her recovery was rapid. Almost at once she began to hear, and step by step she managed to make sense of what she heard. A new world was being opened up to her—had been opened up to her literally by the skill of a surgeon in using a special instrument. A little while afterwards I learnt that she was starting to master the art of speech, and there had been no suggestion of any sort of relapse into her previous deafness.

That happened six months ago. A few weeks back I saw the girl again and the improvement in her was astonishing. She had lost all that air of dullness which had, before,

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contrasted so oddly and depressingly with her good looks. Her eyes had grown brighter, and her general air was no longer one of despondency but of brightness and vitality. There is little doubt that with the rapid progress she is making in speech she will soon be able to forget all those years of virtual isolation and take her rightful place in the world.

One small cause of anxiety remains, as the specialist has stressed over and over again both to her parents and to her. This operation opens up the blocked canal by boring out the blockage, so to speak. There is, therefore, a possibility that later on some trouble might recur. The older procedure, making, as it does, an entirely alternative aperture, is not subject to this risk. As the exact cause of autosclerosis is not yet known, it may be that the proportion of permanent cures by the new technique may not be so high as with the older. Yet the general opinion in America and here is that the risk of recurrence is small. In any case, that small risk seems well worth accepting.

Operations such as these seem to me to represent the highest achievements of modern surgery. Magnificent as it is, the cure of disease does not confer so much to a human being as the re-creation of a lost or missing sense, without which development of personality is impossible. The case of the Indian girl demonstrates this very convincingly. She existed, rather than lived. She was denied the sense that makes possible the use of man's unique power of communication by speech. In working miracles like this, modern surgery seems almost to make man the equal of the gods. Yet for all that, the surgeon remains humble, realizing the imperfections and gaps in his knowledge and seeking always, like Alexander, fresh worlds to conquer. He is more fortunate than Alexander, for even in his greatest conquests, he can see ahead fresh territory to invade in his ceaseless efforts, and to realize his aim of having a solution to every problem that suffering mankind can present to him—an aim that, it is true, may never be realized, though he draws nearer to it every year.

CHAPTER XX

Safety for Mothers

If there is one sector of the health front where there has been uninterrupted and wonderful progress which everyone can see for himself, it is the welfare of mothers and their babies. In the last quarter of a century the reduction of the mortality rate of both mothers and infants has fallen steadily, particularly in this country, where it has been almost spectacular. Moreover, the children being born today are healthier than those of the past. Physically, the next generation should be one of the finest that has ever trodden the earth.

To a large extent this welcome improvement has been due to the provision in so many countries of free or cheap facilities for nursing mothers and their babies. In this country we have the priority free-milk scheme, ante-natal and motherhood centres, a whole elaborately developed service to attend to every possible need of the mother and her child from the moment the pregnancy is recognized. These means alone have been responsible for the saving of many lives, both adult and infant, that twenty years ago would probably have been lost—and also of preventing abnormalities that might injure the mother or the unborn young.

These are the obvious things, none the less praiseworthy for their obviousness. Indeed, that they are so well known and their effects so demonstrably beneficial is all to the good, for even the reluctant, the sturdy independents whose philosophy is that in all matters they can stand on their own feet, have been convinced that such services are essential

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under modern conditions. In many parts of the world, of course—countries like India and China and the backward lands of the Far East—conditions are still appalling, profoundly shocking both to the doctor and to the social-welfare workers. Even here, progress is being made in the face of the opposition that grows from ignorance. All over the world the picture has brightened, and if it has its dark places at any rate we know where they are, and agencies are at work cleaning them.

Obstetrics and gynaecology, the twin sciences that look after the women of the world, have made an immense contribution to this state of affairs. The work done by the surgeon today in these spheres is less well known than the activities of the infant care services, but it is of vital importance. On it are based all the details of the general services.

It barely seems possible that the conditions existing when I was a young surgeon are only twenty years ago, for in the light of today's achievements they seem incredible. The death rate from puerperal fever was still disastrously high among both mothers and babies. Infection could not be properly controlled, and the fear that so many women had of motherhood was not without firm foundation. Operations, when they had to be performed to save either mother or child, were often drastic, and if they served their purpose of saving life they did so very frequently only at enormous cost in suffering and perhaps permanent disability of some kind. The use of anaesthetics during delivery was frowned upon by professional and lay opinion alike.

If this seems an overdrawn picture, let me quote one or two cases that remain in my memory from those early days of my career—days from which I am separated by only a couple of decades. Then let us compare them with what takes place today, not as spectacular events by some gifted surgeon, a law unto himself, but in all the maternity hospitals of the country and at the hands of men who would hesitate to describe themselves as outstanding surgeons in any way.

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One operation carried out in the maternity department of the hospital at which I then worked stands out as a typical example of the danger and complications of the obstetric surgery of the time. A woman had been brought into hospital for examination, and it was found that the unborn child she carried was of excessive size. The chances of anything like a normal delivery were remote, and the surgeon's skill had to be invoked if disaster was to be avoided.

The procedure decided upon is what is known as a pubiotomy. This is quite a major operation, and certainly at that time it subjected the patient to the gravest of risks. The method was to operate on the pelvic bones—the bony girdle that supports the trunk and from which the legs spring. It is one of the most important bony structures in the body, and is particularly heavy in women so that they are able to support the child in the womb.

In this case a most drastic intervention was carried out. In an attempt to create conditions for easy delivery, the bones themselves were sawn through, the idea being that this would provide the pelvic girdle with greater elasticity. The technique had been used for a considerable time, but it was never resorted to except in the most urgent cases, for the results could never be predicted with any certainty—nor could the surgeon entertain much hope that no untoward effects would ensue.

Sometimes it was completely successful, and the woman was able to enjoy a natural delivery and afterwards return to her normal life. But that in itself was looked upon as a minor miracle. Usually there was some damage done, even if the patient survived the very serious interference.

In the case to which I have referred, the results were far from happy. The pubiotomy was carried out, the bone sawn through, and in due course the child was delivered. But the mother suffered terribly. She was, in fact, lucky to survive at all. Never again was that unhappy woman able to walk. It was not merely that the operation, in the most favourable circumstances,

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introduced weaknesses into the important pelvic girdle. In her case, the bones never healed properly. The flexibility it had been desired to impart to her pelvis for the delivery was permanent, and she had been robbed for life of the support without which the human frame fails to serve its purpose.

The Caesarean section is an operation that has been known for a very long time; it is, perhaps, one of the oldest in the surgical textbooks. Yet twenty years ago it was regarded as essentially an emergency procedure to be carried out only when all else had failed. The risk lay in infection, for there is nothing particularly difficult about the procedure itself. If Caesarean sections were infrequently performed, the few that were done carried with them a mortality rate that might well alarm even the most courageous and confident surgeon.

Another case from my period at the same hospital shows the sort of thing that was looked upon as by no means out of the ordinary, despite the tragic outcome. One of the patients in the maternity section was a woman of forty-five, who had married very late and had conceived at a time when many women are already past child bearing. The outlook was serious, for in a woman of her age the pelvic girdle and associated muscles have become firm and set, and are in no condition to respond to the strain imposed by having a first child.

A Caesarean section was decided upon, and the theatre was got ready. One of the best specialists on the staff was to perform the operation and there were restrained hopes that the difficulties of this somewhat unusual case would be successfully overcome. It was not to be, however. Though the woman had the finest attention then available, both she and the child died as a result of the operation. Infection supervened and death was rapid and painful.

This is a case that seems particularly incredible to those who know the modern Caesarean section. The operation is no longer even remotely connected with the dangerous class. It carries with it no more risk than is involved in an appendicitis operation, and so far from there being a need to call in

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an established and experienced specialist for its performance, it can be carried out with perfect safety by the youngest of surgeons. The obstetrician no longer hesitates to make use of the Caesarean section when conditions indicate that it will benefit either mother or child or both.

Not very long ago I was called in to a case in which the attendant doctor had some doubts. The woman was pregnant with triplets, and it seemed to him that she would have considerable difficulties in labour. His doubts were more than justified. This woman's pelvis was most abnormally narrow, and any attempt to induce normal delivery would almost certainly have ended in death for mother and children. Yet I had no hesitation in advising that a Caesarean section should be undertaken at the proper time. No anxiety at all occurred to me, though I knew that twenty years before, a Caesarean in such circumstances would have been regarded as impossible. The woman would, indeed, have virtually been condemned to death. Modern surgery had not only brought the intervention within the bounds of practicability; it had also rendered it perfectly safe. In the end, both woman and children survived, the latter, despite their smallness and undernourishment, eventually developing into healthy youngsters, thanks to the skilled attention which present-day knowledge and care were able to provide.

This is but a sample of the contemporary attitude. The Caesarean is no longer dreaded as an operation of emergency. It is a perfectly normal, routine item in the armoury of the obstetrician, and he uses it freely wherever normal labour seems undesirable.

But it is not merely in operative resource and confidence that obstetrics have made such vast strides. It is safe to say that though technique was so much less developed twenty years ago there were more operations for abnormalities carried out under emergency conditions than there are today. This is because at the present time women are given scientific prenatal care. The development of the foetus is closely

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watched, and anything unusual is detected and if possible corrected at the earliest possible moment. New methods of diagnosis and examination have contributed largely to this desirable state of affairs, which ensures that motherhood is not only safer, but easier and less straining to the woman.

Modern surgery has, too, an effective answer for some of the more serious abnormalities that can accompany pregnancy—conditions that much less than twenty years ago were likely either to prove fatal or, if treated, lead to permanent ill-effects on the mother.

There is a curious phenomenon that sometimes occurs, in which, after a period during which the foetus develops apparently normally in the womb, everything goes wrong. Instead of the embryo growing naturally, it degenerates into a mass of tissue bearing a strong resemblance to a bunch of grapes. When this happens there is no other remedy than surgical intervention: so much has been known for many years.

One of the earliest cases in which I acted as an assistant was of this type. The girl was a strong, healthy human being, a peasant woman, to whom childbirth was a perfectly natural event of which she had no fears whatever. It was indeed only with some difficulty that she was persuaded to present herself at the hospital when the village midwife had decided that something unusual and serious was happening.

She had been married only six months previously, and both she and her husband had been looking forward to raising a family. The idea that at her very first conception she might have difficulties, or worse, was extremely upsetting to her and almost unbelievable. The peasant women among whom she lived seemed to take childbirth in their stride, even though, by modern scientific standards, the death and disease rate would be regarded as unduly high.

Since this was the first case of its kind with which I had had any personal connexion, I was deeply interested, and the details are well fixed in my memory. I remember, even then, recoiling in horror when the surgeon explained to me what

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he proposed to do—yet I knew that, in the then state of knowledge, no other course was possible.

The abdomen was opened and then the surgeon made an elaborate and extensive block dissection. He did not attempt merely to remove the mass of grape-like tissue. Everything was cut away in a single piece—the womb, the ovaries, the whole of the reproductive organs and glands. It was a drastic operation indeed.

So extensive an operation naturally involves very considerable shock to the patient, and for several days we were in grave doubt whether this young woman would continue to live. Only her robust constitution pulled her through. Most women subjected to such treatment would, I believe, have succumbed, and statistics showed that the mortality rate of the operation was alarmingly high. It was indeed reserved only for emergencies.

The upshot was tragic enough—more shocking in fact than the actual operation. I can see the scene again if I close my eyes—the surgeon, seated at his desk; the young peasant husband anxiously twirling his hat in his hands and staring with wide, appealing eyes at the surgeon.

“Thank you, thank you, doctor,” he said, “thank you a thousand times for saving my Maria’s life. It is wonderful of you. I did not think she would live. The people in my village all said that she would die. Now I know they are liars and that God is good. She will come back to me and we can forget this unhappiness in the years to come.” He paused and cast his eyes to the floor. “When it happens again, doctor, there will be no difficulties, will there? I mean——” His words trailed away, for I think he realized the truth but did not want to admit it.

The surgeon shifted his position slightly in his chair and assumed a thoughtful, sympathetic air.

“You must be brave, Antonio,” he said. “You must count your blessings, give thanks for what has been preserved for you, and not ask too much of the goodness of God.” (How

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well he knew how to talk to the many peasant patients who came to that hospital!) "For you see, Antonio, I am afraid I have got to tell you that your wife will never be able now to have a child. There was much we had to do in order to save her life, and I am sure you would not have had us leave it undone if that would have risked her life again. Besides, Antonio," he concluded softly, "surely even if it were not so, you would not have wished to expose Maria once again to the dangers of another operation? These are things we do not understand. We are grateful that we have been able to preserve the life of a lovely young woman."

"Yes, doctor," he said brokenly. There were tears in his eyes. He turned away slowly. I believe I knew the thoughts that were in his mind. He loved his Maria—that was evident. But also he had wanted above all else to be the father of a family. He was young—in the early twenties, as Maria was. There stretched before them both a life of emptiness and barrenness of body and mind. Sometimes I wonder if he cursed the surgeon's knife that had robbed them of their ambitions, perhaps thinking in his secret heart that it would have been better had she died.

From whatever angle one views it, that was a sad and tragic case. A marriage cursed with such a disaster at the very outset might hold within it the seeds of further unhappiness, disillusion. Love might turn to hate. It is against all the instincts and principles of a surgeon to say so, yet I confess that, in thinking over that case, there are moments when I myself feel that swift death might have been a better termination. This was something that not even the resiliency of youth could overcome, for it had taken away one of the very bases of youth.

How does the modern surgeon treat such conditions? Does the surgeon's knife still cure one tragedy by creating the seeds of another?

Working towards its modern ideal of conservation—to preserve wherever possible and never to rob the body of

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anything unnecessarily—surgery has found the solution of this problem as of so many others. The story is best told once more by a personal experience, so much more convincing than a bare recital of scientific facts.

The central figure in this case was the daughter of a personal friend of mine whom I had known for a very long time, having met him in Italy. It had been there that he had fallen in love with an Italian girl, whom he married and brought to England. I had watched his daughter Lilian grow up, and her marriage had been quite an event, almost as though it had been one in my own family.

Within a year of the marriage Lilian conceived, and my opinion was sought as to the best specialist to take charge of her. The family were not very rich, and I knew that they could not pay any exorbitant fees. Moreover, Lilian was a healthy young woman, who had led an active outdoor life, and there was no reason at all why a specialist's care was necessary. I therefore suggested that, for the time being, the family doctor and I should keep her under observation. Only one feature raised a small doubt in my mind. Healthy and well-developed though she was, Lilian was a very small girl—almost a miniature; it was this, indeed, which gave her a very special charm of her own. Possibly, if the child was at all large, there might be a risk of difficulty in labour. That, however, could be decided later.

For three months or so, development appeared to be perfectly normal. At the fourth month, however, there were suspicions of trouble. Development had apparently ceased, but there was nothing else to cause anxiety, and I even suggested that perhaps she had been mistaken in the actual date of conception. She was firm that there had been no mistake, and when at the end of the fifth month nothing further had happened I began to grow alarmed. Accordingly I saw her and her husband together and recommended that a specialist should be called in to examine her.

In my own mind I was fairly sure now that the same

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tragedy was happening to her as had happened long ago to that Italian peasant girl, but I held my peace until the specialist had expressed his opinion. He, too, I could see at once, suspected the same thing as I, but we waited for the results of the X-ray examination. That confirmed our worst fears. The womb obviously held nothing but degenerated grape-like tissue.

But this time the specialist did not discourse on long and extensive block dissections. He was quite cheerful when he saw Lilian.

"There's nothing to worry about," he said. "The operation won't cause you much trouble, and when it's over you'll be able to forget all about it. You're young, you're healthy, you've got a most charming and devoted husband. I wish I had as many of the good things of life as you."

The contrast between the operation subsequently performed and the earlier one made it impossible to credit that the same condition was being treated in both cases. Now there was no complete opening of the abdominal cavity. Instead the incision made was comparatively small and very similar to that employed for the modern Caesarean section. The womb was exposed and found to be filled with the degenerated tissue. No the difference in the new method was brought out vividly. So far from removing the whole reproductive organs, the surgeon took the greatest care not to cause the slightest injury to the smallest part. The greatest thoroughness, however, was devoted to removing all the degenerated tissue. When this had been done, the ubiquitous mixture of penicillin and sulpha drugs was introduced; without these, half the marvels of modern surgery would be impossible. Then the incision was closed, and Lilian was left to the most careful post-operative treatment.

Not very long afterwards she and her husband went to see the specialist. Naturally I went with them, since the case was one in which, for a variety of reasons, I took a deep

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interest. After thanking him for his operation and the success he had attained, Lilian's face clouded a little.

"There's just one other thing," she said in a low, serious voice. "I suppose that now I've had this operation we shall have to give up all idea of having a family. It's a pity, because we did so want to have children; but if it must be, it must." She sighed.

The specialist smiled. "I wonder what put that idea in your head," he returned. "I told you right at the beginning that when you'd had this operation you could go back home and forget all about it as though it had never happened. I've taken nothing away that is vital to you; all you've lost is something that was no use to you. For the rest you're absolutely normal in every way. There is no reason at all why you shouldn't raise quite a large family if you're that way inclined."

"Oh, thank you!" exclaimed Lilian. "That's more than I ever dreamt possible."

Derek, her husband, looked up suddenly with a frown.

"I'm very glad to hear that, doctor," he said earnestly, "but is it really true Lilian's absolutely normal? I mean, surely there's some sort of weakness left? If she had another child, mightn't there be complications? I'd be the last to want her to be exposed to any sort of risk."

This time the specialist laughed. "Really," he said, "you're a couple of most sceptical young people, and I'm not sure that I like having my opinion disputed like this." His expression showed he was only joking. "There's absolutely no chance of risk. Your wife is perfectly strong and healthy—a very fine specimen of young womanhood, if I may say so. I can only repeat what I said before: the best thing both of you can do is to forget all about this operation and what happened. Don't let it depress you in any sort of way. The rest is up to you."

They thanked him enthusiastically and went away.

Practical proof of the truth of the specialist's word was not so long in forthcoming. Within a year of the operation,

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I was told that Lilian was pregnant again, and everything was proceeding normally. Eventually she gave birth to a fine boy, of which she was inordinately proud. Nor was the birth itself accompanied by the slightest irregularity. I myself had held some slight doubt whether, on account of her extremely small size, a Caesarean section might be necessary, but it was not so. She was, as the specialist had said, a perfectly normal specimen of fine young womanhood. And as if to pile proof upon proof, she has since had another child.

Of all the contrasts I have recorded in these pages, this seems to me one of the most dramatic. On the one hand is the peasant girl, doomed through one of Nature's freaks and man's then ineptitude to a life of barrenness and probably bitterness; on the other is a young wife whose smallness suggested that she might in any event have experienced difficulty in labour, laying the foundations of a large family with ease and safety. Yet both suffered from the same abnormal condition on their first pregnancy. To the one it was a disaster; to the other it was no more than an unhappy incident that subsequent events have practically expunged from memory.

If I have here laid the emphasis on the progress of surgery in child-birth cases, it is not to imply that the gynaecologist has not advanced in other fields. On the contrary, he can achieve much that only a few years ago was regarded as impossible. Gland therapy makes it easy for him to treat many distressing states in women, notably at the time of the change of life, when so many undergo tortures through mental and physical disorders. But these are not treatments that demand the skill of the surgeon, with which this book is primarily concerned. They must be mentioned, however, for completeness and to make proper acknowledgment of the fact that today gynaecologists and obstetricians are working daily miracles in making motherhood safer and easing the burden of the many special ills that women have to bear.

CHAPTER XXI

Where Now?

In making these contrasts between the surgery of the days when I was a young man at the start of my career and what it is today, there may be some who feel that I have overstated the case with the justifiable enthusiasm of one who believes in his own profession. If, these critics may say, surgery today is so wonderful, its resources so vast, its procedures so safe and sure, how does it come about that there are so many ailing people in the world? Everyone knows that they are there, and knows, too, that many of them have paid innumerable visits to physicians and surgeons, hospitals and specialists, without gaining any real benefit. The two pictures—the one I have drawn of modern surgery and that of the permanently ill—do not seem to tally. Is there some fallacy? Where does the truth lie?

There are many answers to these questions. To start with, I have set out what modern surgery *can* achieve when skilled hands and brains make use of current knowledge. That does not mean that everyone who calls himself a surgeon has either the knowledge or the skill to apply some of the procedures I have described. In dealing with the latest operation on the ear, for example, I insisted that there were perhaps not half a dozen surgeons in the country capable of undertaking it. This is an important point. It takes some time for new knowledge to penetrate throughout the whole of the profession, more time for the necessary skill and practice in using the new knowledge to be attained.

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Thus there are today many of the older techniques still in daily use—techniques that are good in themselves yet do not stand up to comparison with later ones. That is one reason.

Another important one is that the public themselves are not yet fully aware of what modern surgery can achieve when its principles are properly called upon. They wait. They put off the evil day, as they think it, when they must visit the doctor or the hospital. Often they do not do so until their ache or pain becomes unendurable. The result is that their condition deteriorates all round, and what might have been a wholly successful operation is converted into only a partial success. This was a point stressed in the chapter on cancer. Early and accurate diagnosis is the essential foundation for full success, and it is for the public to see that it is made in their own troubles. Perhaps now that we have a National Health Service on which all can draw, there will be improvement in this respect. At any rate, there is no longer a financial barrier to obtaining advice.

But, when due allowance has been made for these and other factors, it may still seem that I have overdrawn the picture. I have shown how eyes can be made to see, and ears to hear, how such dreaded complications as embolism are being overcome, how the brain and the heart itself are now accessible to the surgeon's healing knife. It is all very wonderful, and may easily give the impression that surgery has reached its zenith, with nothing more to do except refine its techniques in detail.

Nothing is further from the truth. The modern surgeon knows, and is grateful for it, that he can cure and alleviate many complaints that were, only two decades ago or less, beyond his skill. But he makes no claim that he is infallible now or ever will be. Nor does he see finality in sight. For every fresh discovery, every new technique, opens up fresh vistas to be explored. That is why, in this final chapter, I shall glance at possible new roads of development, not only for their own intrinsic interest but also to show that modern

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surgery in general, and this one practitioner of it in particular, is under no illusion that all is right and complete and rounded off in the surgical world.

Some of the procedures we have looked at in these pages are, indeed, merely touching the fringe of vast new fields. Take heart surgery, for example. It is true that, in very recent times, operations have been carried out on the heart itself. But these events are only showing the way. Heart disease is a terrible thing, from which thousands die annually. Encouraged by the success already attained in the preliminary heart operations I have described, surgeons are seeking ways and means of operating on the valves of the heart itself, for it is these which are affected most in heart diseases of various kinds, and most fatal forms are associated with them. The future may see the surgeon perhaps even grafting new valves into the heart. So far as today is concerned, the chief fact is that the possibility of operating successfully on the heart has been demonstrated. Immediately new prospects come into view, and the surgeon realizes how little, in reality, he so far knows.

Much the same state of affairs exists in brain surgery. It is true that brain surgery is much older than heart surgery, but it was not until lobotomy was introduced that the possibility of correcting mental disorder by brain operation was shown. Now this is a very important step forward. How far can the surgeon's knife cut out those terrible afflictions which cloud and distort the human mind, often making it less than human? Here dangerous ground is reached. Surgery comes into contact with medical psychology and psychiatry. What the future has to decide is nothing less than the question of interdependence of mind and body. If, as we have seen, physical operations can cure mental disorders, while at the same time purely psychological attitudes can induce simulated signs and symptoms of disease so accurately that surgeons are betrayed into operation, where does the dividing line lie?

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This, of course, is one of the basic questions of all medical science. It has been discussed for very many centuries. But it is only today that the real scientific basis is being worked out by patient, persevering experiment.

There is another fundamental question to which medical research is turning increasing attention. Why do we grow old? We are so used to taking age, with its failing capabilities of both mind and body, as inevitable—so much so that we regard intensely active old men like, say, Mr. George Bernard Shaw as miraculous—that the very question seems silly. Yet it is not so. Why do tissues degenerate with age, and men and women become prone specially to diseases to which they are relatively immune in earlier years? Is the process indeed the inevitable one we think it is?

Experience with gland treatment has shown that it is possible to restore structures that are missing or under-developed in the body or to restore balances that have been upset. It is no new theory that some sort of gland therapy, whether surgical or other, may arrest the decay of age. That seems a little less fantastic now than it did. The body is equipped with a wonderful system of self-regeneration and restoration. Wounds heal. Every day hundreds of thousands of outworn body cells are replaced by new ones. So far as our physical constituents go, we are barely the same person from year to year. These processes of renewal seem to slow down with age. Medical science wants to know why. When it does so—if it ever does—no doubt means will be devised to offset the process. Then it will be for man himself to decide whether he wants to protract his span of life. Much, no doubt, will depend on the state of the world when the discovery is made.

It is a curious thought that it is medical science's very success that has forced the creation of this new science of geriatrics, as the study of the processes of old age is called. The average age of the world's population, at any rate in the civilized Western parts, is steadily increasing. The

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expectation of life, as the insurance actuaries call it, has gone up progressively. Even in the seventeenth and eighteenth centuries a man who lived beyond forty-five or fifty was an exception. And this longer expectation of life is due largely to the fact that we are now so efficient in curing disease. No longer do people die almost inevitably if they succumb to attacks of pneumonia or peritonitis.

These older people, saved for longer life by medical science, are subject to disease, particularly such things as cancer. To save such cases, the aim of research is to discover the reason for this susceptibility. Already some success has been won.

All this may sound fanciful and fantastic; but so did much that had a similar ring twenty years ago, yet is now accepted as fact, not only in medical matters but throughout all science. Let this thought be pondered. Not so long ago the two main goals of the old medieval alchemists were held up to ridicule as the height of human folly. One was the transmutation of elements, particularly of metals one into another; the other was the elixir of life. Atomic physics has achieved the former end; is it really possible to say that the other is impossible? It may be improbable—but so would the atomic pile have seemed to nineteenth-century physicists.

With the mention of atomic physics we are brought down from the more speculative aspects of the future to the more probable and immediately useful developments of the next few years. Discoveries in nuclear research have already benefited medical science considerably and have pointed the way to powerful new methods both of research and practice. Mention has been made from time to time in previous chapters of the use of artificially radioactive substances, such as radio-sodium and radio-phosphorus. These and similar substances may well revolutionize some aspects of surgery.

For many years now, radium has been an ally of the surgeon—but a rather reluctant and not easily controlled ally. No radium treatment by itself is wholly satisfactory, and

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even when the greatest care is used there is always the risk that some minute particle may remain in the body to carry on its work of destruction. One reason for the weakness of radium treatment is that it is unselective. While it will destroy a tumour, for example, it will work no less, though sometimes at a slower rate, on the sound tissues. Dosage therefore has to be most exactly controlled.

Some of the new artificial radioactive substances get over this difficulty. Firstly they have an extremely short life, some of them reckoned only in minutes or hours. So they can be introduced into the body and no more need be done. After so long, their activity will have ceased and all that is left is a simple, common chemical like sodium (salt). This can be washed away by the normal bodily processes without harm. Then again some of these simple substances have, it seems, a natural affinity for certain parts of the body. Iodine, which is used extensively in treatment of the thyroid, seems to find its way to that gland almost automatically. If, then, radioactive iodine is administered, it will migrate to the thyroid, and the activity may destroy part of the gland, so that operations for over-activity can be dispensed with. This is, at the moment, extremely experimental, but it shows the lines on which some future treatments may go.

Meanwhile these artificial radioactive materials are being extensively used as tracers. If some are mixed with a meal, for example, the course of it can be exactly traced, stoppages located, and so on, because the radioactive atoms betray their presence to suitable instruments. It has already been discovered that some substances diffuse into the bloodstream far more rapidly than has been believed—a very valuable new piece of knowledge. So even if the more remote possibilities of these new materials are never realized, they may teach us much more than we ever knew before about the workings of the body in health and disease—and such knowledge always yields dividends in greater power over illness and suffering.

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Cold is another resource that is attracting the attention of research workers. Ice has been used for a long time in the alleviation of pain, and the application of snow is as good a remedy as anything for frostbite. For some years, too, surgeons have been employing ethyl chloride to refrigerate tissues and so anaesthetize them for very minor operations, since the effect does not endure for very long. Now fresh discoveries are being made. Tissues can live, even though the blood supply is interrupted, at temperatures round about the freezing point of water. This fact may be the foundation of a new science of cold surgery. Damaged limbs and so on in which gangrene has developed may be treated with cold to arrest further development of the decay. Cold may even be employed more extensively as an anaesthetic. The whole of the living processes are slowed up by cold. Here again is a curious bypath that may one day lead into the main highway of surgery.

It is always dangerous to prophesy. Many a line that looks so promising today may turn out to be a cul-de-sac, while other apparently insignificant discoveries may contain the germ of revolutionary treatments and knowledge. So it has often been in all branches of scientific research. But the chief fact of which one can be sure is that surgery will march forward. Its rapid progress in recent years is due, as has been said, to the combination of forces now brought to bear upon its problems—a combination that brings in the biologist and the biochemist, the pharmacologist and the physicist, even the electrician and the mechanic.

The approach to surgical questions is, indeed, becoming more fundamental. Today, as these pages have sought to show, surgery can claim that it has an answer to the question "How?" in regard to the treatment of most of the cases that come within its province. It is not nearly so sure in its answers to the question "Why?" To solve this question, research ranges ever wider. We can deal with the once inevitably fatal embolism, but we still do not know precisely

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what causes an embolus to form. Shock in a patient no longer alarms us; we can even prevent its onset; but there is no really satisfactory answer to say what shock itself is or how it arises. So medical research is following the lead of the other sciences and looking for the fundamentals; for it is a common experience in science that when a fundamental principle has been discovered, a lot of seemingly unrelated facts fall into an ordered pattern and the stage is set for a great forward movement.

That is where the alliance of all sciences in tackling a given problem becomes of ever-greater importance. I have tried to indicate how recent advances in nuclear physics are helping medical science and may help it much more. But that was only one aspect. New methods in one science find their use in many others. The weapons put in one pair of hands may be equally valuable in another.

Take, for example, the electron microscope. Now medical research owes an immense debt to the optical microscope, without which very little of our modern knowledge of cellular activity and the life of micro-organisms would be available. The electron microscope makes possible degrees of magnification—theoretically as much as one million times, though this is not attained in practice—far beyond those possible with the ordinary optical instrument. Research workers are beginning to see what before they knew to exist only by inference.

In medical work, it is specially important that this instrument is revealing the virus to us. Now the virus is one of these undesirable entities that cause disease; some of its type are believed to be responsible for influenza and the common cold. But up till now its existence has had to be inferred. Now it can be seen and studied—and that might even mean that medicine at last would get to serious grips with the common cold, that scourge of humanity that is responsible for so much ill-health and lost time.

Nor is this all. The electron microscope can show single

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molecules of certain substances when those molecules are large, as they are in most of the substances that make up the human body, particularly in the proteins. So now we shall be able to study not merely the cells but also the very molecules at work in living tissues. We shall get to know perhaps precisely what part the proteins in blood play in shock and in general circulation—by the best way of seeing them in action. We shall understand, through direct observation, why when skin grafts are made, those made with skin other than the patient's own are rarely if ever satisfactory in the long run. Perhaps the molecular structure is different. Questions like this the electron microscope may answer for us and so give us fresh material upon which to work.

Skin grafts bring us to plastic and restorative surgery, and here again there is ample ground for advance. New methods are constantly being evolved. We can graft skin, bone, fat, even nerves. How far can grafting be taken? Would it ever be possible, for example, to graft a complete new limb in place of an old one injured or diseased?

This surely is entering the realm of the purely fantastic. Yet it must be remembered that it is only the higher animals that have lost the power of replacing limbs and other structures lost accidentally. Primitive creatures can grow new ones, particularly teeth. Again, experimenters showed a long time ago that it is possible to graft the head of one insect onto an individual of another species—sometimes with surprising results. There is nothing wholly impossible in the idea.

Recent news from Russia shows that even with mammals something of the sort may be possible. An experimenter there claims to have amputated the legs of rats and subsequently to have grafted them back onto the animals. It is a long way from that to grafting a new leg on an injured man; but longer distances have been travelled in medical research.

Again, recall the operation that grafts a new cornea on a diseased eye. It would have sounded incredible a few years

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ago, yet the end has been achieved. In the light of that it does not seem wholly impossible to imagine that one day complete eyeballs may be transplanted.

But we have got away from the point of fundamental research. The many different lines of scientific investigation are coming closer and closer together, and the whole scheme of things is being seen more and more as a unity, with the atom and its habits as a substratum. This is a striking thought.

Surgery and medicine are today developing more and more into means of dealing not with specific diseases but with living processes in disorder. Biological research tells us more and more every year about life and living; the chemist steps in and shows us that underlying it all, including life itself, are complicated chemical reactions; and, finally, the nuclear physicist shows that those reactions are due to electronic behaviour. To stare far into the future, then, one may perhaps discern a world in which surgery as we know it—the science of the skilful knife—has ceased to be; in which medicine, with its pills and potions, has also ceased to be; in which life and living are controlled by master-scientists who organize and direct the electronic behaviour of everything. . . .

The imagination boggles, yet it is not utterly impossible in some remote future. Perhaps some of us may feel that it is as well this should come to pass; it cannot happen for many generations, when we ourselves shall have returned to the earth from which we sprang.

Epilogue

In the foregoing pages I have delved deep into my memory and brought back the details of operations of the past, and I have set them, when I can, side by side with similar operations of today. I have done so, not because I want to decry the work of older surgeons, but because I want everyone to know, for their own benefit, that when we talk of surgical progress we do not mean mere detail improvement but radical advance.

So I would be the last to attempt to decry the work of surgeons of the past, particularly of those—or some of them—from whom I had the honour of learning. For on their work has been erected the whole wonderful edifice of modern surgery. They worked under conditions, even twenty years ago, that would seem to us younger men nowadays intolerable and unbelievable. They had few of the things that we call for automatically as part and parcel of our daily work. In particular they had not penicillin and the sulpha drugs and even newer ones, like streptomycin, which may prove equally revolutionary.

The older surgeons fought, in the main, with the knife alone. They dared not take risks. If they saw a possible source of infection it was better that it should be removed rather than left as a possible source of future trouble, however remote it might seem. So it was that operations became more and more extensive. They sought to keep deadly infection at bay by giving it nothing to work upon. If in so doing they destroyed or much restricted some important human function, they regretted it, but had to regard it as the price that had to be paid for saving life. Of course, they would

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conserve all they could, but for them the dilemma was all too often whether to conserve and take a risk, or remove and eliminate risk. They cannot be blamed if sometimes they took the latter course unnecessarily.

The modern surgeon does not often have to face that dilemma. He combats the ever-present risk of infection with his new wonder drugs, and so he has a much freer sphere of movement. He can afford to ask himself how little he need take away—if indeed he need remove anything. The inflamed appendix—yes, that must be removed; but he does not need to go further as a precaution against problematical peritonitis. If peritonitis comes, he can deal with it; but it is unlikely to do so with the means at the surgeon's command.

It is not too much to say, therefore, that the past twenty years have brought into existence a new science of surgery, different in kind as well as degree from all that has gone before. It is a conservative surgery, a gentle surgery, a restorative surgery, and it can well be a court of first instance as well as the desperate last court of appeal, as frequently it used to be. The surgeon today does not even like the scars he makes to be conspicuous. The patient should leave the hospital in as nearly as possible perfect physical condition; and the surgeon includes cosmetic considerations as well as medical ones in defining that word "perfect".

Yes, these twenty years or so have, I believe, been among the most important in all surgical history, a time of revolutionary and fundamental changes. They are not simply alterations of fashion, but the development of a new outlook, a new philosophy, and a new aim that differs entirely from its predecessor. It has been a great privilege to work through these times of rapid progress, to see a new science—and science is the right word, for much older surgery was an empirical art—growing up before one's eyes, to learn anew, and unlearn much, with the exciting feeling that one was advancing from doubtful ground to good solid rock.

No doubt in time the things that we regard today as

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marvels, the special procedures that now, perhaps, only a dozen men in the world can perform, will look as old-fashioned and primitive to the younger generations as the older ones seem to us. It may even be, as I have hinted in my final chapter, that in the long run surgery itself, as we know it, may wither away and die before the progress of new and more fundamental methods of dealing with the human body in disorder. There is no halt in the march; and in these recent years the tempo of the march seems to have continuously increased.

There is no doubt about it. For the surgeon these have been notable and memorable years. But also, as I look back, I am seized with a feeling of sadness. There is so much I have had to relate of those days that is tragedy—of lives lost, of young people doomed to long lives of frustration, of suffering inflicted to end suffering. Yet the surgeons who worked then were good surgeons, no doubt criticizing in their own minds the crude work of their predecessors. So the endless tale goes on.

There is sadness on me when I think of these patients whose lot might have been so different had fate decreed their birth ten, fifteen or twenty years later. The peasant girl, Maria, might now be surrounded by the large and industrious family for which she yearned. The woman whose pelvis was operated upon might be playing a game of tennis with her son or daughter. The name of Giovanni T—— might be bracketed with that of Menuhin. . . .

The world is full of “ifs” and “ans” like this. The one consolation is that those surgeons did their best, and though their techniques may seem antiquated and even dangerous to us today, at least they passed on to us the true spirit of their profession, which we in turn may hope to impart to those we teach today. That spirit must never die, for surely it is one of the brightest flames in the fire of life.

Not long ago—while I was writing this very book—I was introduced to an old surgeon, now nearly ninety years of age,

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a man whose memories go back to the days of the great ones of the nineteenth century and the controversies that attended the surgical revolutions of the time. He is a charming man, and his brain has remained as clear and alert as it must have been when in his youth he undertook daring interventions that other surgeons said were impossible—though he succeeded often. He has kept abreast of the times, too; and he could discuss modern developments with knowledge and lucidity.

Just before I took my leave and the friendship had ripened between us I asked him a question.

"You have seen many changes," I remarked. "Tell me honestly, if you had your life again would you still be a surgeon?"

He nodded slowly, but with conviction.

"Yes," he said. "More than ever. I have listened to you talking about what you young fellows do today, giving substance, so to speak, of what I've read in the journals and the textbooks, and the sum effect is to make me wish to live again. As you've talked to me, I found myself thinking: Yes, that's what I always wanted to do, but never could. So you see," he added with a smile, "it gets into the blood! You can't escape it—and you never want to."

He is right. There is something more in surgery than the individual who performs it, something that is the expression of man's urge to help his kind. Methods change, but the spirit remains. It was the same in the distant past when some heroic Stone Age pioneer trephined the skull of an injured friend with a little cup of chipped flint. It was the same when sweating surgeons sought to amputate the limb of a man strapped to a table and prayed that the patient might grow unconscious quickly so that the screams might cease. It was the same when Lister operated in a spray of carbolic acid. All those things look crude and barbarous to us in these days, yet each man was serving something more than himself. And I believe that the spirit will still be there unaltered when

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surgery has so changed that we of our time would not recognize it, and our techniques are as forgotten and despised as those of the Middle Ages, when perhaps the surgeon will inject radioactive substances as we now inject novocaine or hormones, when his "knife" is a directed stream of electrons.

Plus ça change, plus ça reste. Was that ever truer of anything than of surgery? Surgery has always meant mending men, sending them back to the world alive and as healthy as possible. If we are able to achieve those ends better than our fathers, that is our good fortune, something of which we should be proud—and we should exercise our pride with humility.

So let no one think that when I have turned back the pages of my memory to recall the entries of twenty, fifteen, even ten years ago, I have done so from any desire to depreciate the older work. Still less have I been animated by any feeling of vainglory or false pride. I have tried to give a picture, albeit an incomplete one, of some of the greater achievements of surgery in this period. If I have drawn upon my own experience, it does not mean that I am trying to exalt my own skill or claim for myself an eminence I do not possess. No. Like every other surgeon, I am part of my profession and part of my times. I can be free of neither. I salute not the surgery of the past, nor the surgery of today, nor the surgery of tomorrow, but the surgery of all ages—the art and science of healing that never stands still, but always marches forward to fresh conquests, knowing perhaps that there will always be some final goal to lure it on though it may never be attained.